vol. IV no. 4
December, 1944

School Shop

FOR INDUSTRIAL ARTS & VOCATIONAL EDUCATION TEACHERS

War Adjusted School Shops Best Prepared for Peace
by William H. Johnson

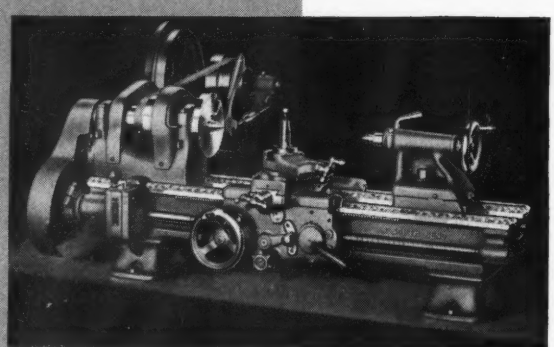
Fire Side Project
by N. H. Poole

Do You Use All the Visual Aids?
by G. Edward Griefzu

Adjustable Angle Plate
by Jon P. Adams
and M. B. Goodwin

On the cover: Student in the Frank Wiggins Trade School, Los Angeles, California, using precision instruments to test airplane part forms.

SOUTH BEND LATHES



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Watch also for the regular features such as "School Shop Kinks," "News from Industry," and "from Washington."

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School Shop

FOR INDUSTRIAL ARTS & VOCATIONAL EDUCATION TEACHERS

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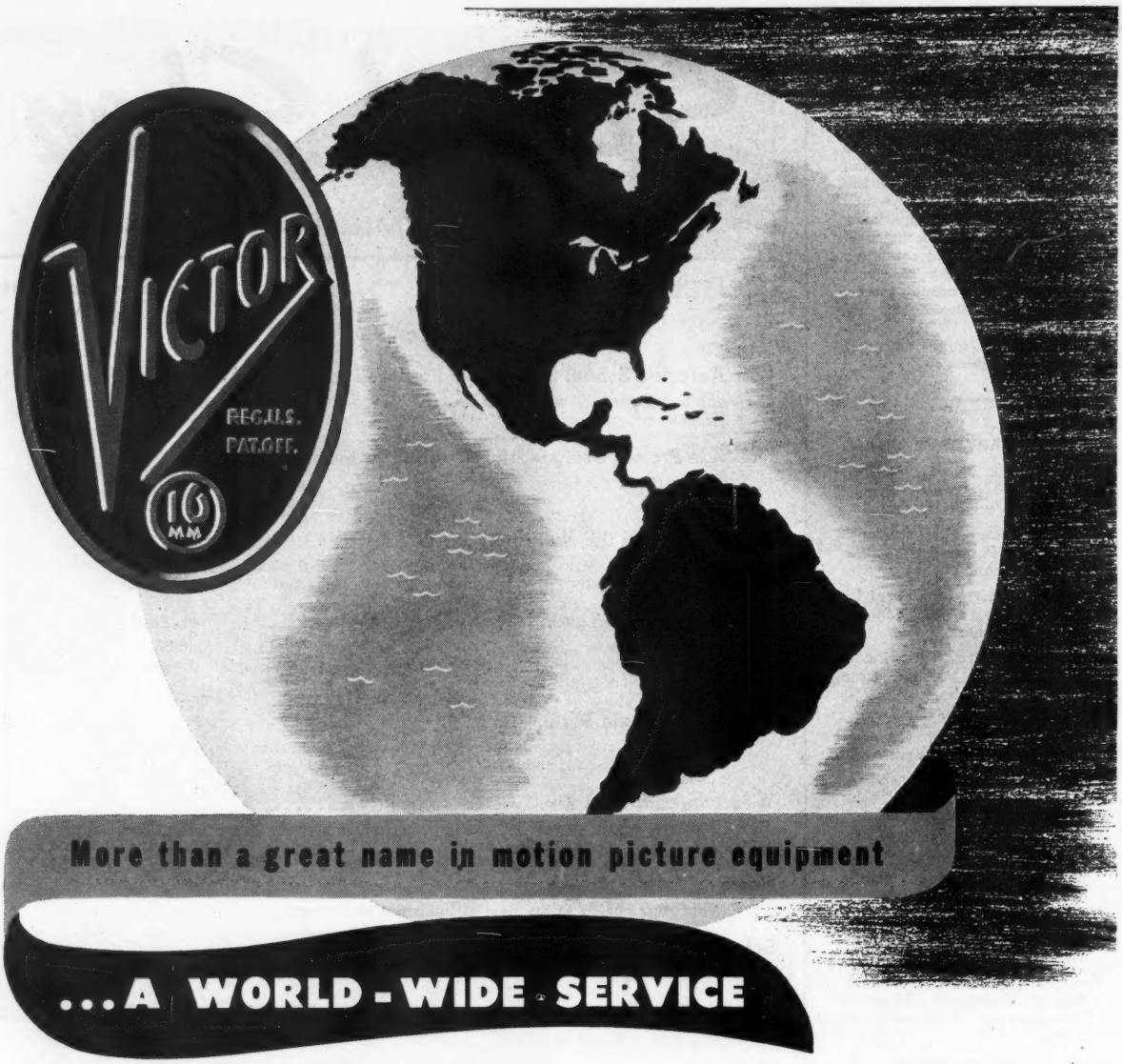

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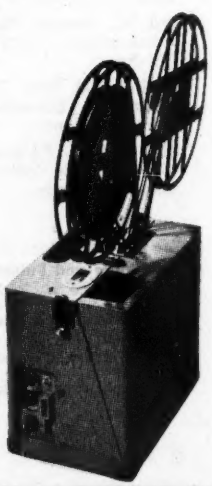

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War Adjusted School Shops Best Prepared *for Peace*

One school in Chicago made 300 stretcher frames for the Red Cross. This is just one of the many services rendered by industrial arts departments in the Chicago school system during wartime that extended the school shop facilities.

BY *William H. Johnson*

William H. Johnson, Superintendent of Schools of Chicago, here tells the story of how shop departments of the Chicago school system converted their courses to wartime demands and how, in doing this, the courses are better prepared to provide students with superior education for the peacetime world.

SCHOOLS which have adapted their shop courses to wartime needs are well equipped to give material aid to peacetime reconversion of industry.

It was recently revealed that the government has plans for 60,000,000 jobs in peacetime industry to maintain an expanding economy, and if these plans materialize, the technical courses in the public school systems that have been effectively geared to wartime needs will be ready to handle the expected pressure on these courses for peacetime training.

What has happened to the industrial arts departments in Chicago schools during the war has happened in other large metropolitan districts in the country, and the story of how these schools have aided in the war effort and how such aid has assisted in streamlining their shop courses is exciting and has real educational significance. In Chicago, the changes effected in shop courses fit neatly into the traditional policy of the Chicago Board of Education—to combine technical training with academic learning as the best means of providing every boy and girl with a balanced education. The new content of courses, the new courses of instruction, the addition of new equipment introduced in the Chicago schools since Pearl Harbor serve as indicators of how schools will meet the increased demands of industry for technical training in specialized work.

This revision has required and received the cooperation of all technical teachers in the Chicago system. Departments asked and received from the Navy, the Air Corps, and the Signal Corps suggestions on how students could best be prepared for their services. Course outlines and various technical service manuals, obtained from the Government Printing Office in Washington, were used to adapt the Chicago high-school courses to government service courses.

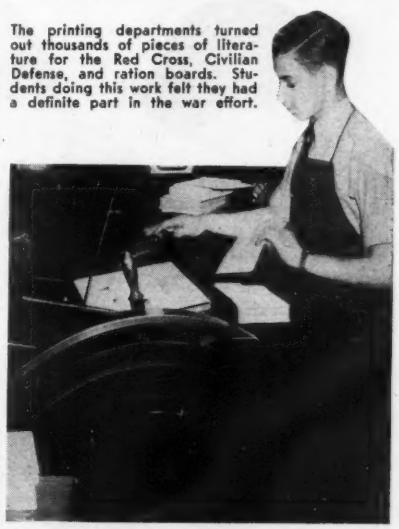
Thus, high-school shop instructors, finding a developmental reading program essential, provided this introductory preparation. These developmental reading programs in technical subjects served these objectives: (1) to provide the student with a new vocabulary in trade terms; (2) to help the student to comprehend the full meaning from instruction sheets and working drawings; (3) to train the student in the reading of technical bulletins and textbooks with comprehension; and (4) to arouse in the student general interest in reading for information. Appropriate reading skill tests given periodically to students taking technical subjects determined whether progress was made. One of the interesting results of the program is that it made more important the reference table in each shop which now makes available to students supplementary materials, dictionaries, and technical magazines.

Machine shop, foundry, forge, and automotive courses have come in for review and revision. In one high-school, both gas and electric arc welding were added to the curriculum. The auto shop was brought up to date by the purchase of several hundred dollars worth of automotive testing equipment. Practical instruction in modern production, such as instruction in the use of alloy steels, of precision measurement instruments, and of gauges in modern inspection methods, was incorporated in the machine-shop course. Similar extension of courses have been made in all the Chicago high-school industrial courses.

To conserve materials, instructors are using smaller projects through which to teach the necessary skills. Many of the boys are making their own bench equipment. To prolong the life of vital materials, students are taught the wise use and care of equipment.

The war having created a great demand for expert draftsmen in isometric projection, a pictorial type of illustration, the Chicago high schools have included courses in isometric and perspective drawing and have placed special emphasis on blueprint reading. At one high school, aeronautical drafting is taught in mechanical drawing and is confined principally to wing sections and reproduction of patterns used in the shops for model plane construction. Detailing of airplane parts receives attention, and special emphasis is placed on present government requirements. Maps for use in Civilian Defense work are drawn and traced by mechanical drawing students and are then produced in quantity on the blueprint machine.

Courses in radio construction and



The printing departments turned out thousands of pieces of literature for the Red Cross, Civilian Defense, and ration boards. Students doing this work felt they had a definite part in the war effort.

motor repairs are being given in electrical shops. Signal and communication work is also emphasized. The courses in radio construction and theory are built along lines suggested by the U. S. Office of Education in the Pre-Induction Training Program. They prepare students for work as wiremen, testers, and repairmen in radio factories or for work in the Army Signal Corps.

One school substituted for the building of a transformer, when copper wire and transformer steel were unavailable, practice in radio code, a practice requested by the War Department. Since the Morse Code was stressed more and more in high-school radio classes, a secondary school aided by building 100 buzzer sets for practice.

A course in Diesel engine operation, repair, and maintenance, which led to a mechanical rating in the Transportation Division of the armed forces, was taught in one of the large technical schools in Chicago. Preflight aircraft engine work, as suggested by the Army-Navy recruiting authorities, was given to two classes of selected fourth-year high-school students. Interpretation of aerial photographs was offered in another high school for those interested in photo interpretation work in the Air Corps. Since plastics will be extensively used in postwar industry, students are working with cast phenolic resins and studying the various types of plastics used in war construction.

Printing departments of high schools have cooperated in every possible way in aiding the war effort. They have printed Red Cross bulletins, school stationery, patriotic posters, and placards. One school alone printed 3000 Red Cross bulletins and 2000 Civilian Defense posters, while another turned out 3000 cards for the Oil Ration Board. Other shops have produced quantities of printed pledges, slogans, patriotic songs, poems, and air-raid shelter signs.

The war demands helped bring the auto shops up to date. A course in Diesel engine operation, repair, and maintenance led to a mechanical rating in the Transportation Division of the armed forces.

Wood shop students have constructed hundreds of Navy identification planes for use in classes in the armed forces. A single westside school constructed the following items as its contribution to the war effort: 1000 solid model planes; 300 stretchers for the Red Cross; 250 game boards for hospitals and recreation centers; 20 bulletin boards for Civilian Defense; and 800 cribbage boards for the Red Cross.

Trailers for use in the scrap drive were built and repaired by a school on the south side. Students familiar with the use of welding torches and equipment wrecked old automobiles preparatory to their sale as salvage material. The Scrap Drive was featured especially by the auto-shop boys, and some 215,000 pounds of scrap iron were collected.

The scope and variety of items made in our technical laboratories are evident from the following contributions: bed writing boards, splints, 1000 ash trays, 100 electric lamps for the Red Cross, games, puzzles, 2 complete ping pong tables, card-table covers for the USO, a booth for the sale of war stamps, bed-clothes hangers, ditty bags for sailors, ice-bag covers, bed-side bags, sewing cases, and 750 to 1000 model planes.

Unless the war closes at an earlier date than we now forsee, students will find themselves either in the armed forces or in a war industry. The skills thus developed in high school will be applied directly toward the attainment of victory. At the same time, the courses as now designed are such that students are better prepared to adjust themselves to a normal world, and the curriculums which have been arranged for them in a period of emergency have been planned to contribute to their total education when peace is attained.

Students are being taught how to conserve materials, how to repair their tools, and how to use them carefully. The war has made this necessary, but the result is excellent learning disciplines.

Fire Side Project Designed for Training in Many Skills

BY *N. H. Poole*

Mr. Poole, who is instructor in the Industrial Arts Department, Emmerich Manual Training High School, Indianapolis, Indiana, has designed a school-shop project which offers work in pattern making, moulding and foundry, forging, welding, and machine shop. The project is also excellent for integrating experiences gained in individual fields of work.

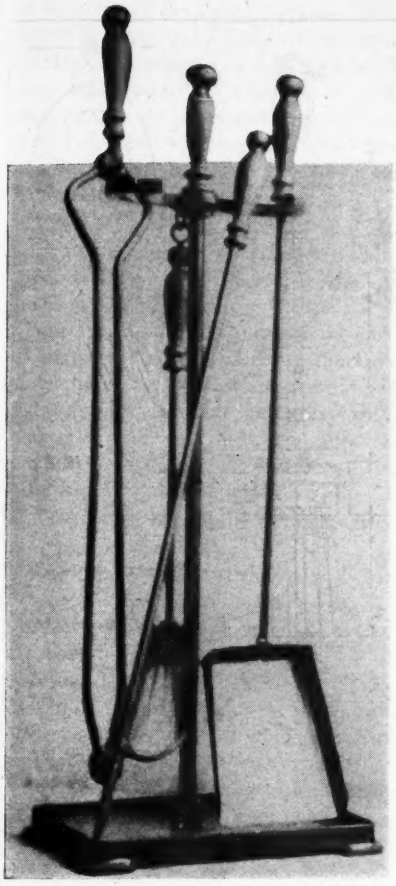


Illustration I

TESTED INSTRUCTIONAL PROJECT

WHILE the fire side set is not a new school shop project, most of those which have been suggested have been designed for the forge shop only. The set offered in this article, Illustration I, is designed for the general shop as well as the unit shop and it is intended to relate, in one project, training in pattern making, moulding, metal casting, forging, welding, and machine-shop practice. In the small high school with the general shop or limited equipment this set can be built by following the optional designs shown in the figures or by having certain parts of the work done in commercial shops.

The bill of materials is for the set shown in Illustration I. If changes are made, sufficient stock should be added to allow for them. The hearth brush was made by cutting the top off of a cheap round clothes brush and forming a metal cup to fit around it. Use mild sheet iron, welded at the joints, for the brush cup.

In the small high school the split patterns for the handles can be turned, the patterns moulded, and the moulds taken to a commercial shop where the brass or bronze castings may be made. Or the handles can be forged as suggested in the optional design, Figure 2a, 2b, 2c, and Illustration II (inserts). The cast handles can be finished by chucking them in a Jacobs chuck in a wood lathe, or in a drill press, or a stationary electric drill, filing to shape and smoothing with various shaped files. Emery cloth and steel wool are also used in the final finishing stages. The handles can be given a high polish by making a canvas buffing attachment for any of the above machines.

The steps to follow in making the set shown in Illustration I are:

I. Cut the ⅜″ round stock for all tools to length. If the stock is hot roll, all scale should be cleaned. The parts may be peined for decoration and if square stock is used each handle should be twisted.

II. Forge the four square, poker point and the part for the spike. Figure 2 and Illustration II.

III. Forge the shovel handle and drill the ⅛″ holes as shown in the drawing. Figures 3a and 3b.

IV. Forge the tongs to shape and cut out the disks for the ends. If the disks are cupped they will hold better. Cupping is done by placing the heated disk in a cupping tool and striking the center of the disk with the ball end of a machinist's hammer. Figure 6a, 6b and Illustration II.

V. Cut the threads for the handles. N. F. threads are preferred since the handles are of a soft metal.

VI. Lay out and cut the miters in the piece of angle iron which forms the frame for the base. Figure 5. Bend the iron while cold to shape in a vise. Do not hammer, but use a steady pull. If any of the miters fit too closely, do not pull them open, rather pull the edges close together and cut a "dutchman" with the hand hack saw.

VII. Cut out the plate for the base, clean and pein or spot finish. To spot finish, after the metal is cleaned, a short length of ½″ dowel rod is fastened in the drill-press chuck. Emery dust or carborundum is spread over the metal and mixed with oil. The drell press is set at slow speed and the revolving dowel pin brought down on the metal for a few seconds. Then the metal is slid over and the process repeated. Coarse valve grinding compound may also be used for a spot finish abrasive.

VIII. Cut and shape the four feet. Also cut the stand rod for the tool support. Thread both ends. Cut the gusset that goes under the stand rod. Figure 1.

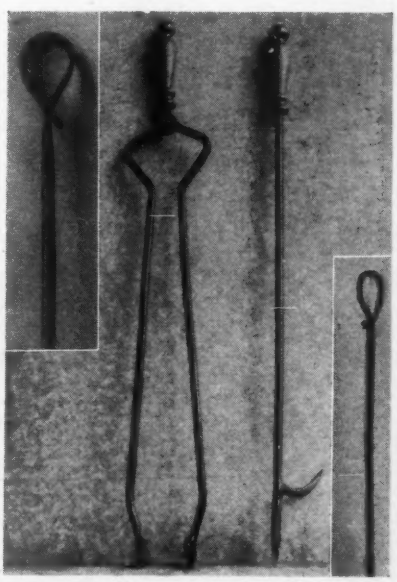
IX. Forge the U-top of the tool rack. Round front corners, drill and tap for the stand rod. Also drill and tap for the brush hook.

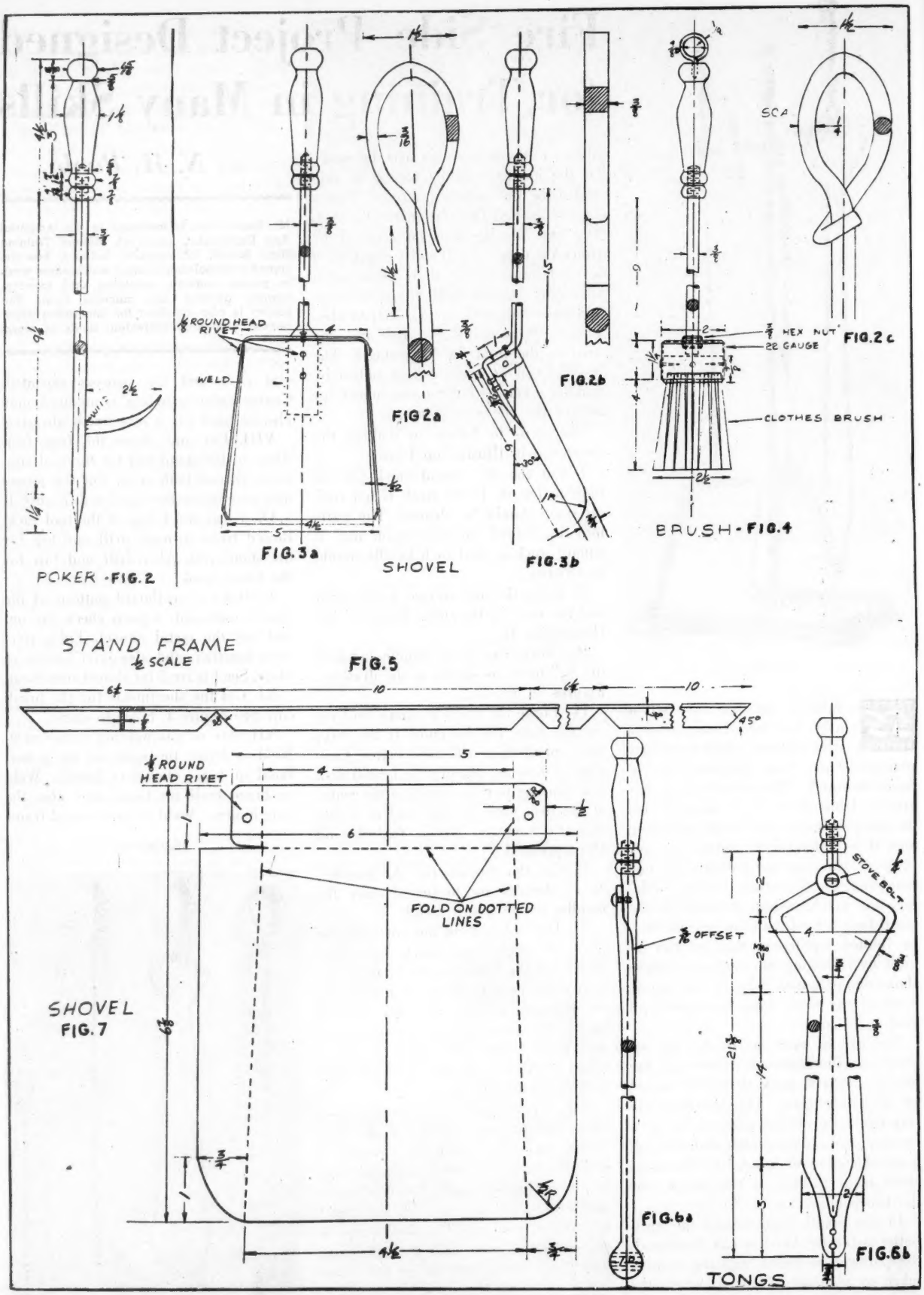
X. Make a cardboard pattern of the shovel, fold, and, if parts check, lay out and cut the metal shovel. Fold, rivet sides together, and also rivet handle in place. See Figure 7 for shovel stretchout.

XI. Cut the sheetmetal for the brush cup. See Figure 4. Form to shape.

XII. Arc or gas welding comes next. Weld or braze the spike to the poker. Weld or braze shovel to handle. Weld or braze ends on tongs and also the tong hinges. Weld or braze stand frame

Illustration II




POKER · FIG. 2
FIG. 2a
FIG. 2b
FIG. 2c
SCA
⅜ HEX NUT
22 GAUGE
CLOTHES BRUSH
BRUSH - FIG. 4
⅛ ROUND HEAD RIVET
WELD
FIG. 3a
SHOVEL
FIG. 3b
STAND FRAME
½ SCALE
FIG. 5
45°
⅛ ROUND HEAD RIVET
FOLD ON DOTTED LINES
SHOVEL
FIG. 7
FIG. 6a
STOVE BOLT
OFFSET
TONGS
FIG. 6b

at corners and the feet to the base. Weld gusset in place. Schools that do not have welding equipment can have this work done economically at a garage or welding shop, or the stand can be assembled with rivets and the tong ends and hinge can be forged or forge welded. Weld brush cup parts together.

XIII. Turn the handle and stand patterns. See Illustration III. Use white pine, mahogany, or cherry. Allow a little for metal shrinkage. Leave a 1/2" diameter by 1" long cylinder on the ends of patterns which is used for chucking when finishing the castings. Mould the patterns, use a double gate, slag trap, and riser and vent well. Scrap brass, copper, or bronze make good castings. Cast iron can also be used.

XIV. Clean the handle castings, drill, tap, and polish.

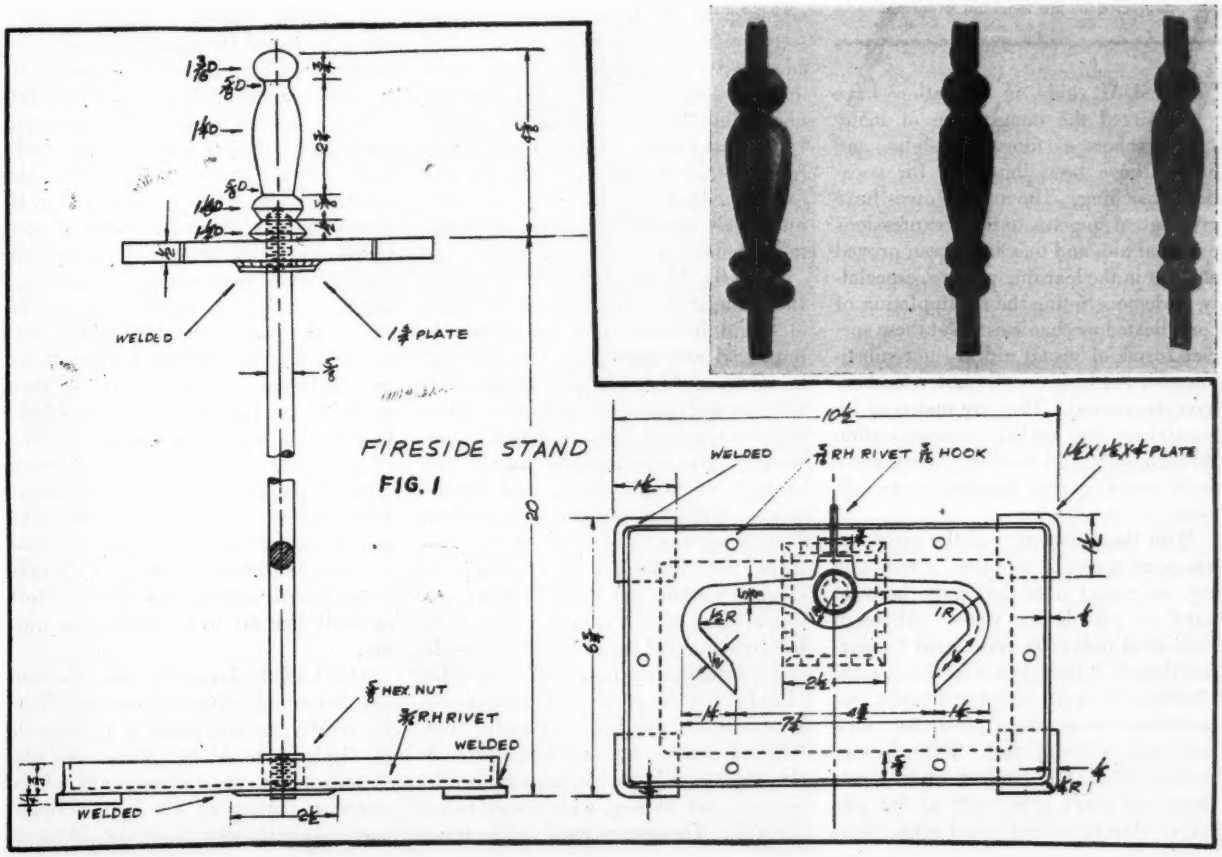
XV. Make the small eye bolt for the top of the brush handle from 1/8" bronze welding rod. The hook is also made of 3/16" bronze rod.

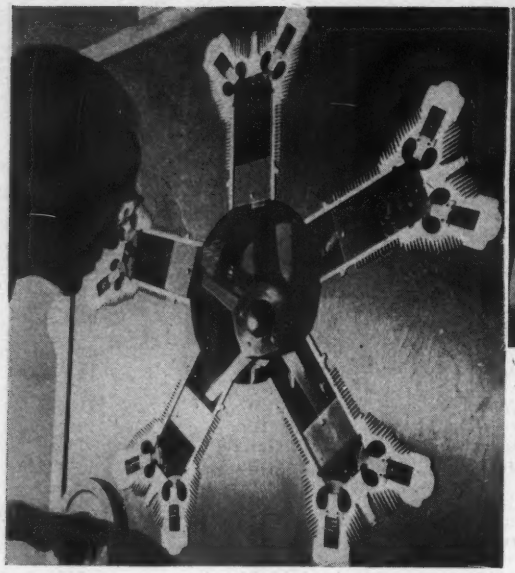
XVI. Clean and polish all parts and assemble. Lacquer all bright parts with clear metal lacquer. Use gold bronze if castings are made of cast iron. Flat black enamel or lacquer should be used on the feet, frame, shovel, and shaft parts of all handles.

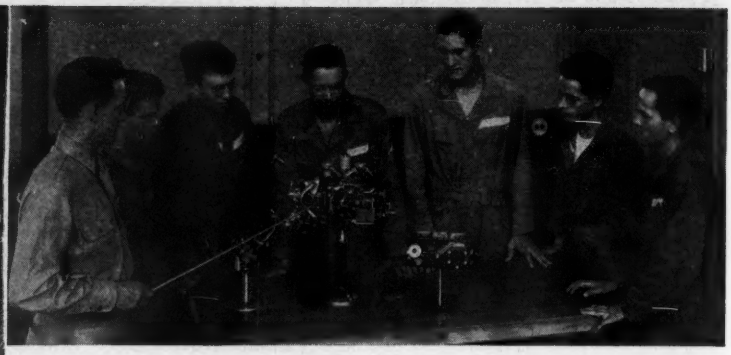
FIRE SIDE SET—BILL OF MATERIALS

PART	MATERIAL	NO. PCS.	THICKNESS	WIDTH	LENGTH
Stand-Handle	Brass Casting	1	1 1/4" Dia.	.....	4 5/8"
Stand-Tool Rest	Mild Steel-Bar	1	1/2"	1"	12"
Stand-Frame	Mild Steel-Angle	1	1/8"	3/4" x 3/4"	32 1/2"
Stand-Plate	Mild Steel-Sheet	1	1/4"	6 1/4"	10"
Stand-Feet	Mild Steel-Band	4	1/4"	1 1/2"	1 1/2"
Stand-Bottom Gusset	Mild Steel-Band	1	1/4"	2 1/2"	2 1/2"
Stand-Top Gusset	Mild Steel-Band	1	1/4"	1 3/4"	1 3/4"
Stand-Center Rod	Mild Steel-Rod	1	5/8" Dia.	.....	21"
Stand-Lock Nut	Mild Steel-Hex.	1	5/8"	.....	.....
Stand-Brush Hook	Bronze Welding Rod	1	13/16"	.....	2"
Stand-Rivets	Soft Iron-Round Head	6	3/16"	.....	1/2"
Shovel-Handle	Brass Casting	1	1 1/8" Dia.	.....	4 1/2"
Shovel-Handle Rod	Mild Steel-Rod	1	3/8" Dia.	.....	19"
Shovel-Scoop	Mild Sheet Steel	1	18 Gauge	6"	7"
Shovel-Rivets	Soft Iron-Round Head	5	1/8" Dia.	.....	1/2"
Poker-Handle	Brass Casting	1	1 1/8" Dia.	.....	4 1/2"
Poker-Rod	Mild Steel Rod	1	3/8" Dia.	.....	11 1/4"
Poker-Spike	Mild Steel Rod	1	3/8" Dia.	.....	2 1/4"
Brush-Handle	Brass Casting	1	1 1/8" Dia.	.....	4 1/2"
Brush-Handle Rod	Mild Steel Rod	1	3/8" Dia.	.....	11"
Brush-Band	Mild Steel	1	22 Gauge	1 1/4"	7"
Brush-Band Top	Mild Steel	1	22 Gauge	2" Dia.	.....
Brush-Cap Nut	Mild Steel-Hex.	1	3/8"	.....	.....
Brush	Circular Clothes	1	2"	.....	3" Bristles
Brush-Brads	Brass	4	No. 16	.....	1/2"
Tong-Handle	Brass Casting	1	1 1/8" Dia.	.....	4 1/2"
Tong-Arm	Mild Steel Rod	1	3/8" Dia.	.....	23 1/2"
Tong-Arm	Mild Steel Rod	1	3/8" Dia.	.....	21 1/2"
Tong-Jaw	Mild Steel	2	1" Dia.	1/4"	.....
Tong-Bolt-R. Head	Mild Steel-Stove	1	1/4" Dia.	.....	1/2"

Illustration III







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Do You Use *All the Visual Aids?*

BY *G. Edward Griefzu*

Visual aids is a term that has come to mean primarily projections, but, as a matter of fact, it means any aid that makes more effective the learning process through the eye. G. Edward Griefzu, teacher of Commercial Art and Sign Painting, at the Thomas A. Edison Vocational School, Baltimore, Maryland, indicates in this article the many useful visual aids at hand and inexpensive to use that should not be neglected in the teaching program.

VISUAL aids in education have stirred the imagination of many teachers as filmstrips, slides, and movies have been improved for vocational teaching. The armed forces have given great impetus to these expressions of visual aid, and they have been proved efficient in the learning process, especially in demonstrating the manipulation of complicated mechanisms. But these special forms of visual aid are not substitutes for teaching, as all master teachers have discovered. They are means of intensifying the verbal communication through sight and hearing. They make both teaching and learning more efficient.

With the popularity of the projector has come a new recognition, a rediscovery, of visual aids that have been at hand in schools for years. Although schools of today are considered "underprivileged" if they do not have available blackboards and bulletin boards, we find these conventional facilities often neglected or poorly used. While lack of enterprise of the teacher often keeps these and other aids, such as flat pictures, objects, models, and trips, from being used systematically in connection with the course, lack of "know how" is probably more responsible for neglect of these aids in teaching. There is evidence, also, that teacher training has failed to stress sufficiently the methodical use of visual and auditory aids. The literature in the field of audio-visual aids is remarkably unimaginative, and only now, as projector aids flood the field, is some of the written material taking practical form. Even the projector aids now available are not used adequately, which indicates to the writer that the method of teaching is not geared to making full use, methodical use, of audio-visual aids. Many schools whose funds do not yet allow them to add projector facilities might at least use more intensively the several visual-aid facilities at hand.

Take the blackboard as an example. It is one of the oldest forms of visual aids and it lends itself excellently to industrial arts teaching. Yet it is haphazardly used; rarely is it prepared in advance with planning and care. Illustrations that have been prepared before sessions give concreteness that is impossible to convey orally, and supplemented with flat pictures and models, even projection slides or motion pictures, they make for thoroughness in communication and tend, furthermore, to maintain student interest. The writer has found useful for developing complicated designs, drawings, and layouts for blackboards the perforated pattern, and recommends its more extensive use. After the pattern has been transferred to the blackboard, the design can be developed, step by step, with several colors of chalk. The pattern used for the transfer can be stored and used in the future.

Illustration upper left: CUTAWAY VIEW OF RADIAL ENGINE.—One of the most interesting and intricate over-sized models developed by the Aviation Education Service of the CAA is this scale copy of a radial engine. Dr. Edgar Fuller of the CAA is about to turn the crank which causes the pistons to slide up and down in the cylinder heads, intake and exhaust valves to operate in proper order, and flashing lights to indicate the firing order of the cylinders. Upper right: An instructor in the Air Corps Technical Schools at Chanute Field uses "objects" to explain carburetor operation.

It is easy to make the patterns. Reproduce the selected design on a piece of wrapping paper of suitable size, either by use of the square method (see figure 1) or by projecting the design of required size through an opaque object reflector on the paper. The drawing is then placed on a piece of soft cardboard (a piece of corrugated carton side is satisfactory), and the entire design is perforated (see figure 2) with a perforator, a small, inexpensive tool that can be bought from any dealer handling supplies for sign painters. The reverse side of the pattern should then be sandpapered to clean off the burrs left by the perforator. The pattern is then ready to be transferred to the blackboard. To make this transfer, a bag of powdered chalk or a dust saturated eraser is pounced over the entire design. This produces the design (see figure 3) in a series of small dots that are clear and easy to follow. Small symbols may be devised to indicate the various colors of chalk that are to be used in the tracing.

The bulletin board is also a useful aid that could be used to greater effect. To realize its full potency, a schedule of displays should be planned to synchronize with the current units of instruction. Most of the bulletin-board material will consist of flat pictures,

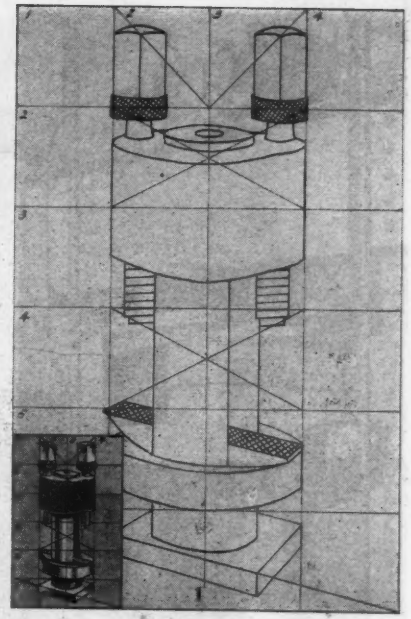
charts, plans, and diagrams. Some shops use to advantage bulletin-board materials that have been gathered or drawn by a committee of students in the shop. Student attention is thus attracted to the board.

Flat pictures are valuable aids and should be used more generally. If properly filed, they can be called into use quickly. But in addition to pictures, posters, cartoons, and clippings might be gathered by the instructor and by members of the class. There is a wealth of material in magazines, newspapers, trade journals, and advertising displays. Quite often a poster or cartoon will "drive home" a point much more effectively than it could be done by any other medium. Here again, if the students can be enlisted in searching for materials pertinent to the study, the interest in the discussion will be intensified and the file can be kept "live." The writer has found that these flat pictures should be mounted to preserve them and to keep them in an attractive condition.

Objects, specimens, and models are available and should be gathered by the instructor for demonstration. An object (the real thing) should be used whenever possible, although, in many instances, a specimen (a part of the real thing) will suffice. In case it is impossible to obtain these, a model (replica) should be used. Cutaway models, working models, cast models are all helpful to students.

An increasing number of projection facilities are available, some of the new ones suggesting new supplementary aids to instruction. The opaque projector which projects through reflection pictures or objects 6″ x 6¾″ in maximum area is the projector preferred by the writer. For one thing, a picture 6″ x 6¾″ can be projected in full color; and for another thing, the pictures are easier to obtain, require less preparation, and are inexpensive because they can be clipped from magazines, newspapers, and similar sources, and projected directly from textbooks. If sufficient funds are not available for machines of this type, a class in industrial arts could easily construct one.

Projectors using 2″ x 2″ slides and 4¼″ x 4″ slides are made in portable, compact sizes. Some instructors find slides convenient since they can be singled out and arranged in combinations as required. The filmstrip projector is convenient for showing sequences. Since it uses 35mm film, full frame or half-frame, the sequences can be made by those instructors who know photography. The filmstrip projector with



50-watt bulb can be used for a class up to 30 or 50 students in a darkened room. Projectors with 300-watt bulbs—they are now quite compact—can be shown to a small class in a lighted room. The sound-slide films are most effective, and small compact outfits with 100-watt projectors and with facilities for using 12″ and 16″ records are available at very reasonable cost. They are no heavier than a portable typewriter and not as large in area as a standard typewriter. Yet they are powerful enough to be seen and heard by an audience of 200 or more. The sound (record) slidefilm libraries have been greatly augmented by the war, and many commercial concerns have sound slide-films that show industrial operations of first-rate educational value.

Still another piece of equipment available to the instructor is the "reader," a projector which throws the picture on a screen within a box-like structure. Several of the makes are useful for viewing by four or five students and can be used near machines or at benches. Since they project 35mm film, operations in sequence can be shown and used. Ready for postwar production is a projector that can be directed vertically or horizontally or at angles in between. It will

(Continued on page 24)

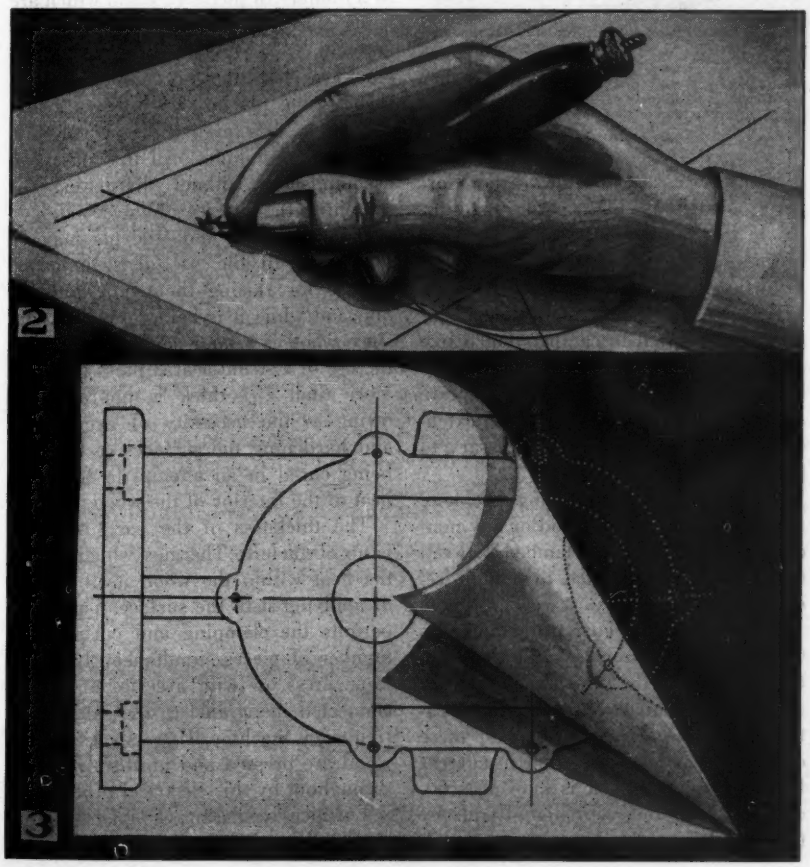


Figure 1, top of page: USE OF THE SQUARE METHOD FOR ENLARGING—The original design is covered with squares of a size suitable for locating most of the detail. The proportion of enlargement depends on the size of the squares used in the reproduction.

Figure 2, left: The perforator is used like a pencil, appling just enough pressure to force the spurs into the soft cardboard. Most models have a swivel that is a great aid in tracing small curves and circles. Very small details can be perforated with a phonograph needle mounted in a piece of dowel. Figure 3, left bottom: A pattern showing the face, part of the back, and the transfer to the bloackboard.

"Welded" Wood Takes New Hold on Industry

BY

Orval C. Husted

Two 4" blocks of wood are being clamped and cured simultaneously in this press to which is attached a high-frequency heating unit. It takes only a few minutes to cure the glue this way.

Many woodshop teachers have expressed interest in more details on the use of high-frequency dielectric heating of wood which now bonds plywood in minutes instead of days. Orval C. Husted of the Girdler Corporation, Louisville, Ky., and former shop teacher, has written for SCHOOL SHOP this authentic report for the shop teacher who wishes to keep abreast of new wood fabrication possibilities in industry.

THE wood shop teacher today is a liaison officer between youthful manpower and industry. As such he must know what is going on in industry and keep himself and his students aware of new and far-reaching developments.

Just as welding has revolutionized fabrication with metal, so high-frequency dielectric heating is opening up new vistas in fabrication with wood.

Mass production of fabricated wooden parts for planes, boats, and other implements of war is now being achieved in many factories by connecting high-frequency heating units to the molds, clamps, or presses. When the wood and glue is thus placed between electrodes a uniform heat is rapidly generated throughout the entire mass. In this way temperatures of 170 to 200 degrees cure the glue in a matter of minutes instead of hours.

The speed demanded in producing this work, the large quantities required for war use, and the uniform high standard of quality necessary have made manufacturers keenly aware of the possibilities of high-frequency heating.

Research in this field has been carried on for several years by the Girdler Corporation of Louisville, Kentucky, resulting in the development of the Thermex process which makes use of molecular distortion for heat production.

Portable Thermex units in the smaller sizes are enclosed in cabinets much like a radio. Although these high-frequency machines are highly technical, they are as easy to operate as a radio. No extensively trained personnel is necessary to keep one in operation.

In plain nontechnical language here is what happens when wood or any nonconducting material is clamped between two electrodes connected to a high-frequency machine:

Ordinary electric current for homes is 60-cycle current. In each cycle there are two reversals of the direction of the flow of current: positive to negative and negative to positive. There are 60 of these double reversals each second in current for domestic use, so it is known as 60-cycle current. But with high frequency this speed is stepped up to several million such reverses in a second. Each change of current direction causes the molecules of any nonconductor between the electrodes to change shape. These rapid distortions of the molecules cause friction which is manifested in the form of heat.

If this object being heated happens to be a number of pieces of wood which are being glued together, the glue heats just the same as the wood. As a result the glue, especially the thermo-setting types such as the phenol formaldehydes and urea glues, is rapidly and evenly set in a matter of minutes. All this has been accomplished without hardening or scorching the surface of the wood.

Some teachers and students may be familiar with the use of steamheated platens for raising the temperature of plywood while it is being glued up. But since wood is a poor conductor of heat, the use of a steam-heated press for parts more than ½" thick is impracticable owing to the necessity of overheating and hardening the surfaces of the part being cured in an attempt to force the heat to the interior of the wood.

The thickness of the part, however, is no obstacle to Thermex which creates the heat within the wood itself instead of applying it to the surface. This often permits the clamping and curing of a number of pieces simultaneously in the same press, or with a series of clamps connected in parallel to the same high-frequency machine. Huge stacks of plywood are pressed and uniformly heated throughout by this electrical process.

Formica Insulation Company in Cin-

(Continued on page 20)

Teach Your Students Better, Faster Sanding

with the same SKILSAW BELT SANDERS used in Aircraft Production!

Photo from DURAMOLD Division of Fairchild Engine and Airplane Corporation

You'll make better craftsmen out of students *quicker* if you teach them fine finishing work with SKILSAW BELT SANDERS . . . the sanders *preferred by industry* for power, speed and ease in handling.

In the aircraft industry, for instance, a prominent manufacturer found that ONE MAN using a SKILSAW BELT SANDER could do a better sanding job in ONE HOUR than TWO MEN formerly could in 3 to 4 HOURS!

No wonder SKILSAW BELT SANDERS have such widespread acceptance! They're lighter, better balanced for easier handling . . . more powerful for faster work on the production line . . . or in your manual training shop. Ask your distributor for a demonstration at your school today!

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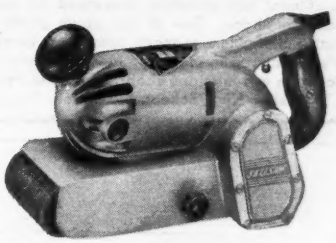
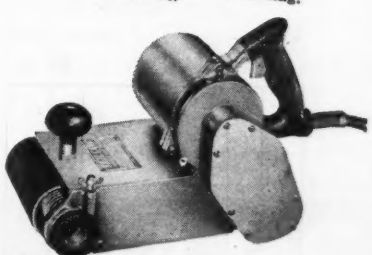
ZEPHYRPLANE
The modern, streamlined belt sander with 3-in. belt. Ideal for all sanding and final finishing. Powerful, ruggedly built for long, trouble-free service.



ZEPHYRPLANE, JR.
With 2¼-in. belt . . . outstanding lightweight belt sander for intermittent use in woodworking and cabinet making. Weighs only 9½ lbs.



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With 4½-in. belt . . . a fast, powerful belt sander for toughest sanding and surfacing jobs. Also MODEL "B"—same size with vacuum dust collector.

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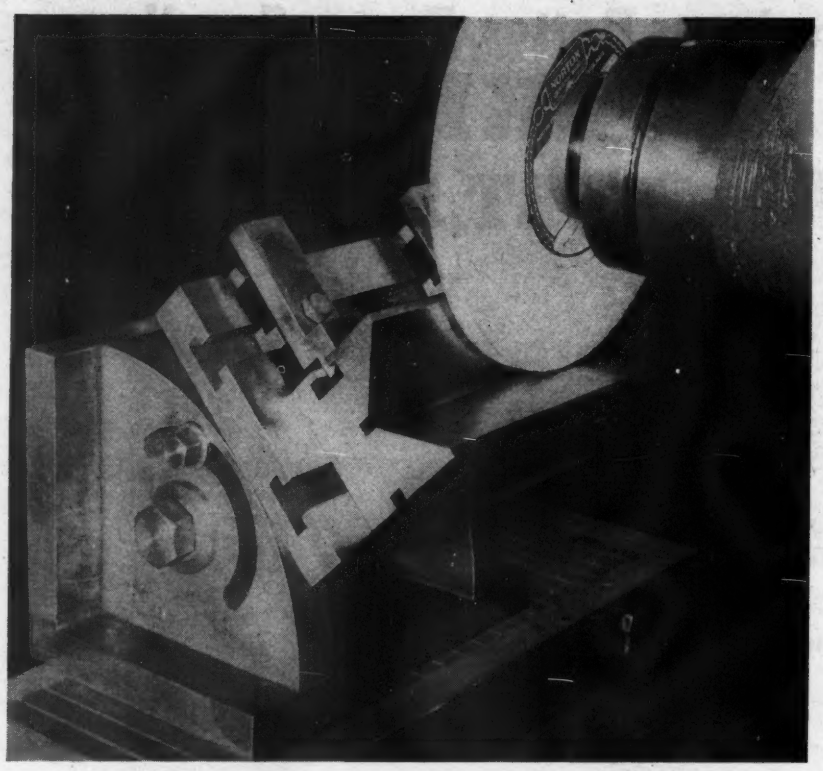
MAKE AMERICA'S HANDS MORE PRODUCTIVE



Adjustable Angle Plate

BY *Jon P. Adams* AND *M. B. Goodwin*

This seventh project in the machine-shop series by the authors is a description of a piece of equipment not normally possessed by school machine shops. Use of the angle plate will enable instructors to teach operations frequently encountered in industry. Messrs. Adams and Goodwin are machine-shop teachers at Proviso Township High School, Maywood, Illinois.

TESTED SHOP PROJECT

BECAUSE of the variety of work done in the modern school shop, this adjustable angle plate will be of great help. It is sturdy enough to be used on milling machines, shapers, drill presses, and surface grinders. In the April issue of SCHOOL SHOP a tool for dressing an angle on a surface grinder was described. Many of the jobs done on angular work can be done with straight wheels, using this angle plate. We have found that any angular job can be done with either one or the other of these tools. This tool is accurate enough for work ground to commercial tolerances. For more accurate work a sine plate must be used. The construction of a sine plate will be given in a later article in SCHOOL SHOP.

The castings for the adjustable angle plate are preferably made of "Mechenite." If it is not possible to get them made of this material, cast iron will be satisfactory. Be sure to get close-grained castings. It will be well to have several of the angle-plate bases cast because in themselves they make excellent angle plates without the adjustable angle feature.

The machining of the parts presents no problem. The 90° base is machined on the two 90° surfaces and on the ends with a face mill or on the shaper. The inside surfaces of the two webs that form the bases must be machined. This can be done with an end mill used in a vertical head on the milling machine. If both inside surfaces are milled with one set up, absolute parallelism will result.

The holes in the trunion are now bored. This can best be done on the milling machine. A 5/8" drill is first used followed by a boring bar. The hole is enlarged with the bar to .747 and reamed to .750.

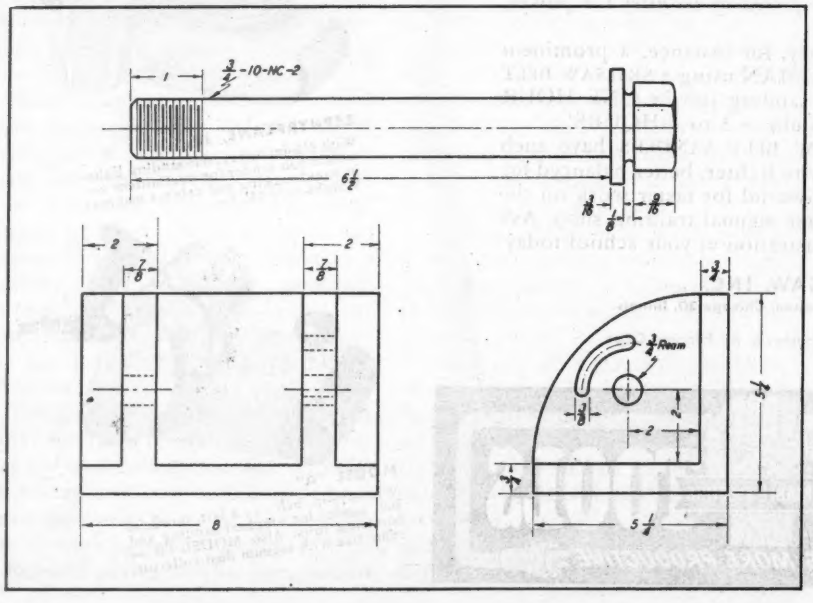
The adjustable piece is finished on all surfaces indicated on the drawing. The dimension 4" from the outside of one base to the outside of the other must be milled so that it will just slip into the base plate. The "T" slots are milled during the same set up used for milling the top flat. The two holes are faced using the same procedure as the base plate.

The screw is made of S. A. E. 1020 case hardened and ground to the finished size.

The locking slot in the base can be milled with a rotary table by centering the 1¼" hole on the center of the table. A vertical head is then used to mill the slot. If the rotary table is not available, the slot can be laid out and drilled and filed to size.

All of the surfaces of the adjustable angle plate should be ground, including the ends. The face of the adjustable part should be ground after assembly,

(Continued on page 14)



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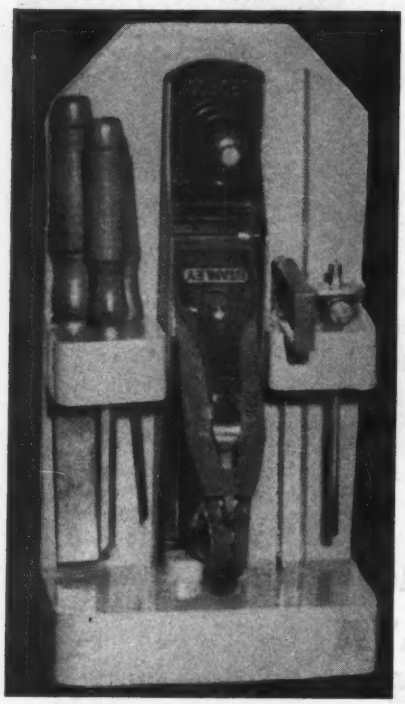
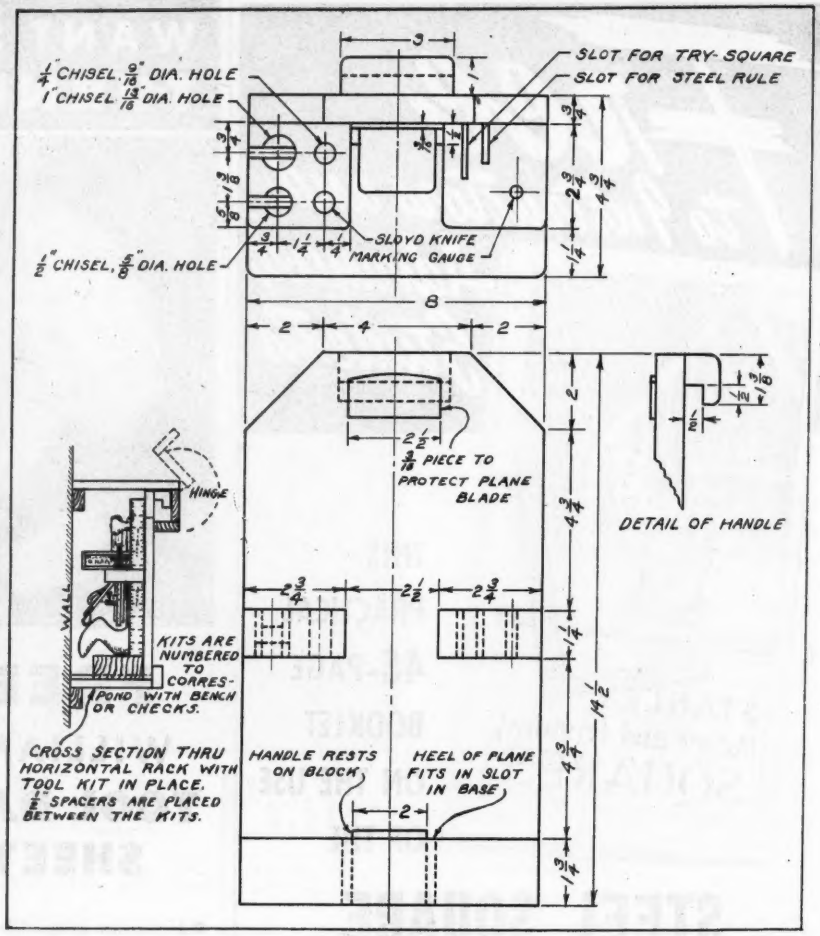
Woodworking Tool Kit



BY *George F. DePuy*

This kit is an aid to good shop housekeeping. The author is head of the Industrial Arts Department, Central Michigan College, Mt. Pleasant.


1/4" CHISEL, 9/16" DIA. HOLE
1" CHISEL, 13/16" DIA. HOLE
1/2" CHISEL, 5/8" DIA. HOLE
SLOT FOR TRY-SQUARE
SLOT FOR STEEL RULE
SLOYD KNIFE MARKING GAUGE
3/16 PIECE TO PROTECT PLANE BLADE
DETAIL OF HANDLE
HINGE
WALL
KITS ARE NUMBERED TO CORRESPOND WITH BENCH OR CHECKS.
CROSS SECTION THRU HORIZONTAL RACK WITH TOOL KIT IN PLACE. 1/2" SPACERS ARE PLACED BETWEEN THE KITS.
HANDLE RESTS ON BLOCK
HEEL OF PLANE FITS IN SLOT IN BASE

TESTED INSTRUCTIONAL PROJECT

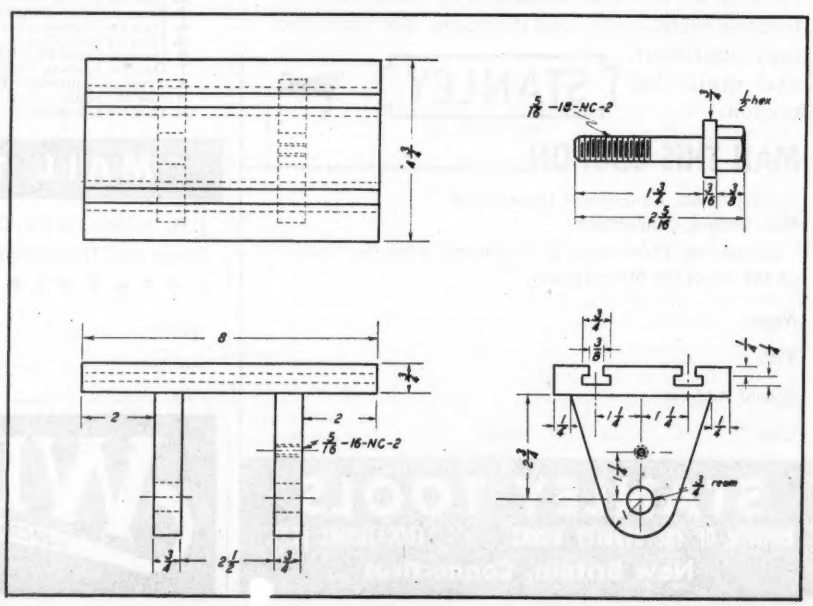
THIS design for a portable tool container for woodworking tools has proved to be very satisfactory in the general shop. The kits may be stored on a shelf in the toolroom or kept in a special cabinet in the shop. The containers are numbered so that they may be checked out or assigned to certain benches.

The container is made entirely of wood and assembled with glue and screws or nails. The assortment and sizes of tools may be varied by changing the sizes and arrangement of holes or slots.

This kit takes up very little space on the workbench and the tools are in a convenient position for use.

Angle Plate ... *(from page 12)* thus assuring absolute parallelism.

Many of the details have been omitted but the reader will find that this is an easy project to make in the average school shop and one that will find many and varied uses. The base of this fixture, having a 90° angle with the side, is an advantage. Many jobs that would require another set up can be ground by placing the fixture on its side or on end.



news

WHAT'S DOING IN THE FIELD OF INDUSTRIAL EDUCATION

THE program for the Reconversion Vocational Training Conference of the American Vocational Association to be held in Philadelphia December 6-9 indicates a highly significant meeting. All departments of the association will participate. President John A. McCarthy has asked the association vice-presidents to direct their meetings to the central problems of vocational education's responsibilities in shifting from wartime training to training for reconversion and long-range peacetime tasks ahead. Executive Secretary L. H. Dennis reports that more than 200 vocational leaders will participate as speakers or panel members in more than 70 different meetings planned. The future of vocational training at home and abroad will be discussed by vocational leaders and Washington authorities in the international field. Training for veterans will dominate many section programs. Authorities from the War Department will tell vocational educators of the interests and attitudes of returning veterans which must be considered in planning training programs. Representatives of labor, management, and the armed forces will join with vocational education leaders in one afternoon session entirely devoted to various aspects of conversion training. Headquarters will be at the Benjamin Franklin Hotel.

CARDBOARD models of naval aircraft instrument panels together with student's and instructor's manuals were distributed in May 1944 by the U. S. Office of Education to 4500 high schools teaching preflight aeronautics. A limited number of these instrument panels are still available for distribution. Schools desiring them should address requests to the U. S. Office of Education, Washington 25, D. C.

THE DoALL Trade School, organized in July 1941, has moved from its former location in Minneapolis to new and larger quarters in Des Plaines, Illinois, a suburb of Chicago. At its new location, the school is housed in a large, modern plant and, in addition to instruction covering the operation, application, and maintenance of DoALL equipment, trainees also receive valuable first-hand test data and setup experience, even before this information is released to the field. With over 74 percent of the total training time spent in practical shop work, the course has been cut to a four-week training period. Class schedules and general information can be had by writing to the Director, DoALL Trade School, 254 North Laurel Ave., Des Plaines, Illinois.

THE Industrial Arts Section of the Southwestern Ohio Teachers' Association met in Cincinnati on October 27. The attendance was reported good and a spirit of enthusiasm prevailed concerning future possibilities for industrial arts. The officers in charge of the program for this past year have been: President, Dr. John A. Whitesel of Miami University and Secretary, Herbert G. Richter, Bloom Junior High School, Cincinnati. Those elected to have charge of the meeting next year are David Wheery of Cincinnati as Chairman and William A. Yaekle of Miami University as Secretary.

WANTED

SCHOOL SHOP is looking for good manuscripts in all fields, especially woodworking, visual aids, and radio. Be sure to include good photographs and drawings. Send to The Editor, School Shop, Ann Arbor, Mich.

Sheldon

PLANNING ASSISTANCE

. . . can help you

School architects, administrators and teachers, aware of postwar educational imperatives, are basing school building designs on tomorrow's needs. In planning special rooms and selecting vocational and laboratory equipment Sheldon can be of unusual assistance. Sheldon will also assist you in compiling budget estimates and writing specifications. Write today — request Sheldon Planning Assistance. Without obligating you in any way Sheldon Engineers will call and discuss your problems, ideas and plans.

LABORATORY AND VOCATIONAL furniture

E. H. SHELDON & CO. · MUSKEGON, MICHIGAN

These people buy a battleship —every week!

Meet John S——— and Mary D———

John works at an electronics plant on Long Island, and makes $85 a week. Almost 16% of it goes into War Bonds.

Mary has been driving rivets into the hide of one bomber after another out at an airplane plant on the West Coast. She makes $55 a week, and puts 14% of it into War Bonds.

John and Mary are typical of more than 27 million Americans on the Payroll Savings Plan who, every single month, put a half a BILLION dollars into War Bonds. That's enough to buy one of those hundred-million-dollar battleships every week, with enough money for an aircraft carrier and three or four cruisers left over.

In addition, John and Mary and the other people on the Payroll Plan have been among the biggest buyers of *extra* Bonds in every War Loan Drive.

When you come to figure out the total job that John and Mary have done, it's a little staggering.

They've made the Payroll Savings Plan the backbone of the whole War Bond-selling program.

They've helped keep prices down and lick inflation.

They've financed a good share of our war effort all by themselves, and they've tucked away billions of dollars in savings that are going to come in mighty handy for both them and their country later on.

When this war is finally won, and we start giving credit where credit is due, don't forget John and Mary. After the fighting men, they deserve a place right at the top of the list. They've earned it.

You've backed the attack—now speed the Victory!

School Shop

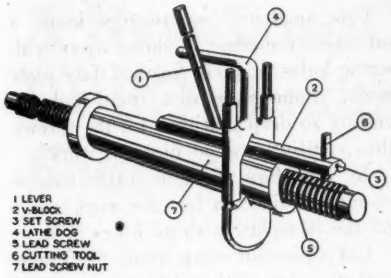
This is an official U.S. Treasury advertisement—prepared under auspices of Treasury Department and War Advertising Council

School Shop KINKS

A dollar will be paid for each "Kink" published. Send to the Editor, School Shop, Ann Arbor, Mich.

Repairing Machine Lead Screws

A quick and easy method of reconditioning threads on lead screws damaged either by accident or normal wear is in use at General Electric Company's Erie Works.



A lathe dog (4) clamps a V-block (2), machined to hold a cutting tool (6) to the lead screw nut (7). When a tool bit, ground to fit the thread, is inserted in the V-block and locked with a setscrew (3), the nut acts as a die with a single point cutting tool. The tool will clean burrs and bumps preceding the nut, which is held stationary by a long lever (1), while the screw (5) is driven by a lathe.

Since few shops are equipped to machine such long pieces, the usual procedure is to file off the deformities. This involves considerably more time than the proposed method of repair, which can sometimes be performed without disassembling the screw.—*Clifton Roberson, General Electric Company, Erie, Pa.*

Chamfering Dowels

Instead of buying commercially prepared dowel pins, many woodwork and general shop instructors prefer to buy dowel rods of various diameters and have the students cut their own dowel pins as they need them. In this way the dowel can be made the exact length necessary for the job.

After the dowel has been cut the ends must be chamfered. The ordinary pencil sharpener has proved to be a safe, fast, and efficient tool for this purpose. Dowels 7/16" to ¼" in diameter may be chamfered very well in the ordinary one-hole sharpener, and those less than this diameter may be chamfered in this man-

(Continued on page 18)

AN IDEAL ALL-PURPOSE MACHINE FOR MANY SHOP COURSES

Foredom FLEXIBLE SHAFT MACHINES

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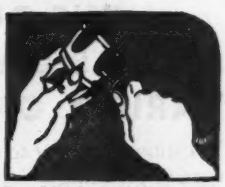

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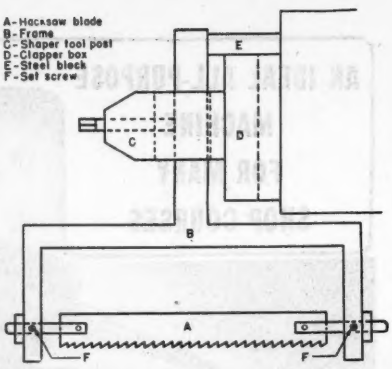
ner also if one is careful to hold the dowel in the center of the hole. Sharpeners with an adjustable front guide or receiving plate will efficiently accommodate dowels of any diameter up to 7/16".

Care should be taken not to remove too much material from the ends of the dowel since this will lessen its holding power. For the usual job, 1/16" to 1/8" chamfer is sufficient.—*Einar E. Siro, Ft. Knox, Ky.*

Use Shaper as Mechanical Saw

When small dimensional material must be cut accurately and there is no power saw available to do the job, a shaper is occasionally used as a mechanical saw at General Electric's Schenectady Works.



SHAPER USED AS MECHANICAL SAW

As shown by the sketch, the arrangement consists of a metal frame with two standard blade holders. The "handle" projects vertically so that it may be inserted in the tool post of the shaper. Block "E" is placed so that it holds the clapper-box rigid. The setscrews "F" prevent the blade from twisting.—*C. P. Fisher, Jr., General Electric Company, Schenectady, N. Y.*

A Trick in Turning

Few amateur wood-turners know a satisfactory method of doing away with screw holes in their finished face-plate work. Some even nick their tools by cutting so deep that they hit the screws, thus spoiling a good piece of work.

In my shop there is little trouble along that line; in fact the work comes off the face-plate with no holes in it.

Cut a piece of scrap wood, preferably soft, the size of the plate; then a piece of heavy drawing paper the same size. Glue the paper between the scrap and the wood to be turned, clamp and leave overnight. Screw the plate onto the scrap and turn. The paper will not tear if the cutting is done with sharp tools and a medium cut.

When the work is finished, remove the face-plate and have someone hold the project, resting the edge of the scrap wood firmly on the bench. Put a chisel directly on the edge of the paper, bevel toward the scrap, and strike it a sharp blow. The paper tears cleanly through the center, leaving half on the scrap and half on the project.

Caution: Heavy drawing paper is the best; paper towels or thin paper will not do, as the glue will soak clear through and form a union.—*Harry G. Clarke, Cabinet Shop Instructor, San Leandro, California, High School.*

For All the Trades

My shallow wooden cupboard for composing sticks is painted black, while the outlines of the composing sticks are painted white. On each of these silhouettes is painted the number of the composing stick that hangs in front of it. With one glance, I can tell if a stick is missing, and the number of the missing member. . . . This kink can be used to good advantage in any shop. Cupboards that contain hammers and pliers and triangles, etc., can easily have added to them their painted silhouettes.—*A. Lewis Herzberg, L. G. Hine Junior High School, Washington, D.C.*

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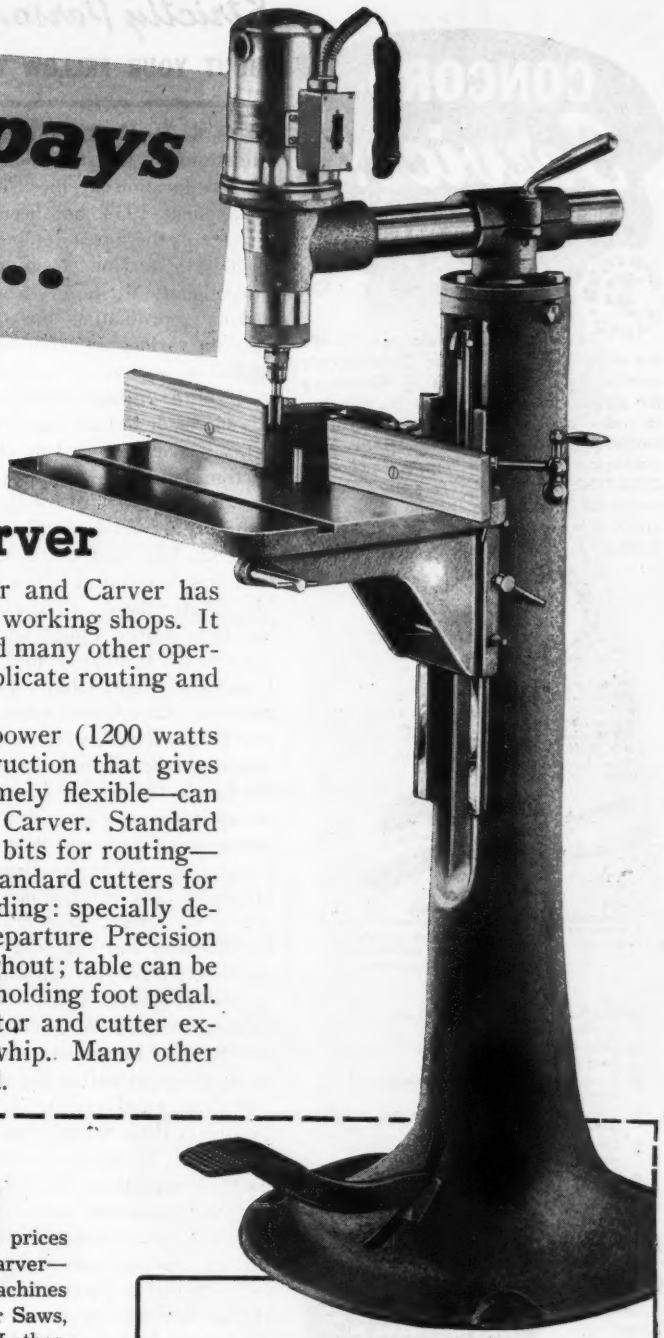

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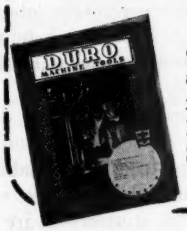

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ABOUT YOUR FELLOW TEACHERS

JAMES R. D. EDDY, who has been administrator of the state board for vocational education at the University of Texas since 1937, has been appointed director of the bureau of industrial and business extension training, effective November 1. Mr. Eddy's new duties will include coordinating the training offered in various university departments related to extension and the development of a unified statewide program. His successor has not been appointed as yet. . . . New supervisor of War Production Training equipment and of the vocational division of the Missouri State Department of Education is DOYLE KEMPER, for eight years in the industrial arts department at the Maplewood, Mo., High School . . . ROBERT O. HALL has been named industrial arts supervisor at the training school, Kent State University, Kent, Ohio . . . RAYMOND SCOTT of Ann Arbor, Mich., is now in Sao Paulo, Brazil, where he is teaching men of the Brazilian Army Air Corps in the *Escola Tecnica de Aviacao*, a school set up in cooperation with the U. S. Departments of State and War for the purpose of instructing the Brazilian Army air cadets and enlisted men in ground school mechanics. Mrs. Scott is joining her husband and will also teach at the school . . . For 14 years an instructor in the Hopkins, Minn., Junior High School, CHARLES W. SELDEN is now instructor in industrial education and occupations, as well as the supervisor of part-time employment in the Niles Township High School, Skokie, Ill. . . . LYMAN A. EMERSON, professor of industrial education, Cornell University, has been appointed assistant dean, College of Engineering, to direct industrial teacher training and problems relating to vocational and secondary schools . . . DR. R. H. SNITZ, professor of industrial arts at the Indiana State Teachers College, Terre Haute, Ind., has retired . . . GEORGE DUERKSEN, Roosevelt Intermediate School, Wichita, Kans., has taken over the teaching of machine drafting, taught last year by H. W. MCKIMMEY, who has been appointed vice-principal in addition to his duties as head of the industrial department at East High School . . . AUGUSTUS NOAH MAY, professor of industrial education at the University of Kentucky, died September 20, 1944, at the age of 68. Enjoying the longest period of service of any person in vocational education in Kentucky, Professor May pioneered in the establishment of area trade schools in the state, a system which is rapidly gaining recognition throughout the nation . . . LT. (JG) HOMER C. ROSE, USNR, has been transferred to Amphibious Training Base, Little Creek, Va., where he is officer in charge of instructor training for the ashore and the afloat training program.

Welded Wood... *from page 10*

cinnati is doing mass production of laminated wood blocks 52" long, 10½" wide, and 6½" thick for further manufacture into aircraft propellers. Uniform heating of a 6" stack of wood can be done only with the high-frequency method which generates heat within the block itself, curing the glue in several minutes and keeping the production line moving efficiently.

Steinway & Sons piano factory, now making cargo-carrying glider parts, turns out a wing bow 1 1/16" x 13" x 16¾' which formerly required a curing time of four hours. A urea-formaldehyde glue is used as a bond between the eight ⅛" laminations. Since the press has been adapted to high-frequency heating the clamping time is reduced to 8½ minutes.

Electrodes can be the press itself if it is metal. They can be wire, sheetmetal, rod, or even sprayed metal paint. So long as the electrodes are kept a uniform distance apart, there is practically no shape which cannot be heated uniformly.

High-frequency dielectric heating is employed also in the molding of plastics. It has an important place in the textile and rubber industries, and it has been quite successful in destroying infestations in flour and cereals. New uses are being discovered almost daily and the Girdler Corporation maintains laboratories where extensive tests are made for far-sighted production men who are able to visualize possible uses for high frequency in their business.

Although it may be some time before many school shops will be installing such equipment, the alert teacher will keep himself and his students aware of the accomplishments and the possibilities of high frequency.

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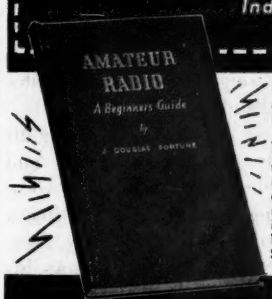

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Learning the Type Case

BY *R. Randolph Karch*

This article on one of the technics of teaching printing is the first in a series which will be carried from time to time under the same authorship. Mr. Karch, principal of the Graphic Arts High School, Cincinnati, Ohio, is on military leave and is serving as a lieutenant in the U. S. Naval Reserve, Training Literature Section.

LEARNING the locations of characters in a type case is merely the means to an end in industrial-arts education: the ability to set a bit of type according to the objectives of the course. The student need not remember the lay of the case when the course is completed. In vocational education, the knowledge of the case is a necessary skill—to be so over-learned that it is not easily forgotten.

In either type of education, the less time spent in learning the lay of the case, the more efficient the teaching and learning. The best technic for teaching the lay of the case is one which

1. Reduces memory work to a minimum.
2. Increases manual activity to a maximum.

Printing instructors usually teach the lay of the case in the same way they were taught, and by one of the following methods:

1. Hit-and-Miss Method: The student is given a type case, and told to "learn it." He does learn it (a hard way) by examining each character. This method does not present enough activity, and the student loses interest.

2. Reference Method: The student looks at a wall (or individual) chart, which indicates the locations of the characters in the case. He learns by finding the character on the chart, and then locating it in his case. This method wastes time.

3. Layout Method: The student is given an empty case and a font of type. He lays his own case, by reference to a chart. This involves a considerable amount of "busy work," and does not guarantee that the case is learned.

4. Memory Method: The student is given a picture of the case, and is told to "learn it." He is then tested by giving him a blank picture of the case, on which he fills in the letters without reference to the pictured locations. This method is not popular with students because it requires inactive, pure memory learning.

5. Learning-Through-Doing Method: A card is printed with each character at the top, which fits into each partition of the case. The cards are placed in the bottom of each box. Quads and spaces are likewise marked.

By this method the student learns the location of each character by actually setting a series of jobs. He learns through doing—not by a memorization process. This method is found to be the most popular with students—there is no "case-learning" period of time involved.

Experiments have been conducted with controlled groups with this method as against Method 4. Those students working under Method 5 did more work, and cases were no more jumbled than when students worked under Method 4.

Generally the only criticism of this method is that printers frown on labelling cases. This is a childish criticism which has no bearing on the case—any devices which increase the learning process by making it less painful and more interesting are worth their inclusion in a course.

Another criticism is that one cannot see the label because the case is full. Cases should not be too full in schools —their very weight when full militates against safe handling.

This method is recommended for all industrial-arts printing courses, and also for the elementary sections of vocational printing courses. By the time a student completes his elementary vocational typesetting course, he knows his case layout, and can be trusted to work on cases not so labelled.

The problem of jumbled cases can be controlled by the assignment of individual cases to students. A common case for two or more students *never* works—it is always the "other fellow" who does the mixing. Cases are inexpensive; they cost about two dollars each in the California size. A thirty-case open rack can be purchased or built for a few dollars. Such cases need only about ten pounds of type. For the little expense involved, it is wasteful to require more than one student to work on a single type case—to save a few dollars initial investment, learning is slowed down year after year.

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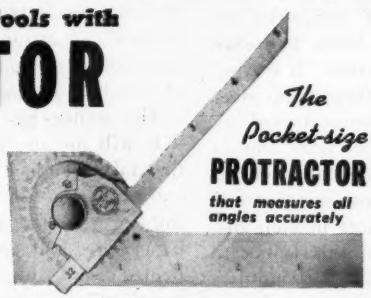

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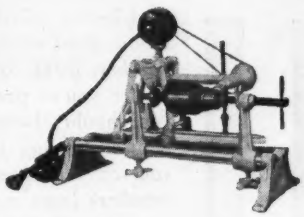

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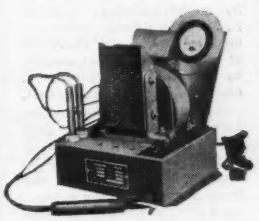

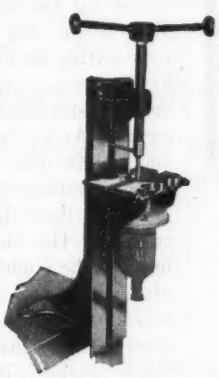

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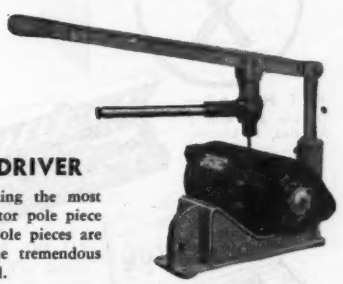

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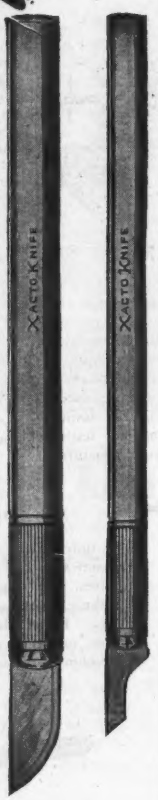

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Visual Aids . . . *from page 9*

come equipped with several lenses of short and long focus and can be used at the desk in front of the class and projected from the rear of a small screen at the front of the desk, or it can be projected directly on the screen at the bench or at the machine. It will use 35mm film which can be moved by motor from remote position.

The use of motion pictures is now more or less common in most large school shops and an increasing number of excellent craft films are available. An instructor using this equipment will soon learn that motion pictures cannot be used indiscriminately. George Fern and Eldon Robbins in SCHOOL SHOP for October, 1944, offer this simple test: "After you've previewed the film—and you should always preview every film before showing it to your class—ask yourself this question: 'Will the class members learn more during the twenty minutes or half hour it takes to present this film than they would have learned if they had used this time for other work?' If your honest opinion tips the scales of your judgment well in favor of the film, it's a good indication that the film has value for your class."

In looking over a catalog of available motion pictures, select films that fit the sequence of subject matter in your course for the semester and order the films in this list in a block to insure your getting the film on time. It is wise, by the way, to space these films over the semester in well proportioned intervals. As in the use of texts and of material in other media, make note of those operations which you question and point out these differences in your discussions. The object of this is not to impress the students with the rightness of the instructor's point of view but to indicate to students that there are often other methods than those demonstrated. While motion pictures as other visual aids are essential supplements to lectures, they should not be overused. Too many haphazardly selected pictures might confuse the students, whereas a few well-selected ones will help clarify the subject matter for students.

Class and individual trips also come within the field of audio-visual aids in teaching. Interest and inspiration are developed through wise planning of trips to industries, machine shops, printing and newspaper plants, jobs under construction, etc. The instructor has the responsibility of managing the trip in such a way as to use the time of students effectively. Bad public relations often result from trips because instructors have not explained to students the necessity for showing courteous attention in return for the privileges granted by the industry. By talking over the trip in advance with the students, the instructor can point to those phases of operation to which students should give special attention. The remarks of the instructor should be directed to arousing active rather than passive interest. They should be encouraged to ask questions of operators wherever this is possible. A little time should be spent in discussing in advance deportment on these trips, thereby sparing the instructor from being a disciplinarian during the trip. While there should be a free and jolly feeling on the part of the students during the trip, students must be impressed with the serious objects of the trip.

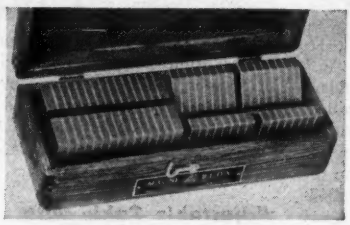
The writer has also found value in individual trips. A student whose interest needs to be aroused might be assigned to view a certain operation, say at a machine shop, and to report his observations to the class. This will draw out many students who otherwise are passive or listless, and at the same time it will keep the students informed about the newest trends in the field for which they are preparing to enter. It also demonstrates to them how the skills they are learning are put to use in the world at work. Students also often acquire an entirely new attitude toward their work by catching the enthusiasm and interest of a skilled workman.

The writer has learned that visual aids will not do his teaching, nor will they take the place of good teaching. No substitute has yet been found for the influence of the teacher's knowledge, experience, and personality on the student. Visual aids when properly used, however, can extend this personal influence.

MAGNE-BLOX

For Use On Surface Grinders

Every instructor of surface grinding methods can use the universal Magne-Blox set to good advantage. Every shop requires the use of these parallels and V blocks to hold work that cannot be held on the plane surface of the magnetic chuck. Magne-Blox obtain their holding power from the chuck itself.



The set costs only $14.50 and consists of 2 laminated parallels measuring 1" x 1¾" x 3¾" and 2 laminated V blocks measuring 1¾" x 2¾" x 1⅞". Write today for our 8 page folder "Time-Saving Devices for the Grinding Room". This also gives full information on larger parallels and V blocks, angle irons, radius dressers, indicators, micrometers, etc.

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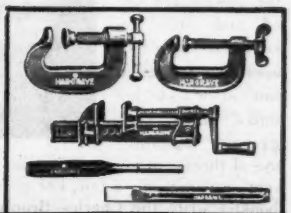

The CINCINNATI TOOL Co.

The Radiant Screen here illustrated is Model DS—a portable Metal Tripod Screen—sturdy but light, compact, easily set-up, quickly adjustable. Available in sizes from 30"x40" to 52"x72".

Screens Especially Designed *For School Needs*

To Meet the Requirements of Every Type of Visual Aid Program

The new line of modern Radiant Screens, incorporating many new and special features, includes Wall Screens, Wall and Ceiling Screens, Table Screens as well as the Portable Metal Tripod Screen ranging in size from 20" x 30" to 20 feet x 20 feet and larger. These screens are sturdy, long-lived—easy to operate and they are available with the improved Radiant "Hy-Flect" Glass Beaded Surface that permits the projection of visual aids with greatly increased brilliance, clarity and contrast. Today—thousands of schools, universities, institutions, and government agencies use and endorse Radiant Screens.

Radiant Portable Models Offer You:

In addition to the "Hy-Flect" Glass Beaded Screen Surface—you will find many special conveniences and unique advantages in Radiant Tripod Screens. These include:

1. Automatic Clutch. A positive device that permits instant raising and lowering of screen housing without the necessity of manipulating screws and bolts. So simple and easy to operate a child can use it.

2. Quick Tripod Release. Tripod legs may be opened and closed quickly. They support the screen in *any* position for wide or narrow spread without set screws or plungers.

3. Auto-Lock. (Pat. applied for.) Just touch convenient button for raising or lowering center extension rod and screen instantly.

4. Convertible from Square to Oblong—for movies, stills or slides, Radiant square sized screens are convertible to oblong by merely raising screen to indicated position.

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Please send me FREE complete Radiant Screen Bulletin giving full specifications, features, prices of complete line of Radiant Tripod, Wall, Ceiling and Table Screens for schools, homes, clubs, and industry.

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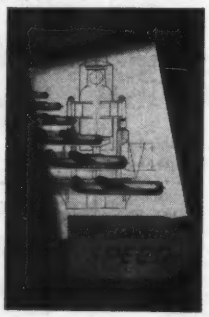
. . . news from INDUSTRY

Tooling Guide Book

How to Machine Parts on Turret Lathes, a tooling guide book regularly priced at $1, may be obtained by lathe operators and teachers at a cost of only 50c. The 64-page, 8½" x 11 "book with index contains information on taper turning, internal threading, reaming, sleeves, pulleys and shaves, etc. A section on the analysis of what basic machining operations are required is included. Write the Operators' Service Bureau, Warner & Swasey Co., Cleveland 3, Ohio, *or check number 34 below,* enclosing 50c.

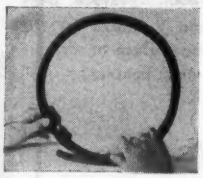
Prints for Speed



A 24-page booklet describing the BW direct printing process is now available from Charles Bruning Company. The many advantages of the process are listed and fully described—speed of operation; elimination of washing tanks, driers, etc.; greater legibility; use of sheets cut to exact size; low electric current costs are only a few. For your copy of the booklet write the Charles Bruning Company, 4700 W. Montrose Ave., Chicago 41, Ill., *or check number 35 below.*

Leather V Belts

Modern design in Schieren leather V belts is fully treated in a brochure available from the company. Because of the high coefficient of friction made possible by the full grain leather sides of the belt, the belt may be run under lighter tension and at the same time will deliver more revolutions per minute than any ordinary belt. Lighter tension produces less wear on bearings and machinery and less strain on the belt itself.



The belting comes in rolls in three standard sizes and may be cut to size with the aid of portable tools supplied by the manufacturer.

Belt installations can be made quickly and easily right on the drives, thus eliminating the usual tearing down. For full specifications write the Chas. A. Schieren Co., 30-38 Ferry St., New York 7, N.Y., *or check number 36 below.*

Handbook on Universal Cutter and Tool Grinding

Covel Manufacturing Company announces an *Operator's Instruction Manual* designed to aid the apprentice in acquiring a broader knowledge of grinding operations and machines. Ready-reference features incorporated into the booklet make it easy to find the sections on grinding machines, adaptability, grinding wheels, methods of setting up milling cutter tools for grinding, tables, glossary, and alphabetical index. Photographs and illustrations, 128 pages. Price, $1 to teachers. Write the Covel Manufacturing Company, Benton Harbor, Michigan, *or check number 37 below.*

Hole Cutter Set

Designed to solve holecutting problems faster, more accurately, and at a far lower cost than fixed radius tools, these Clark hole cutters operate efficiently as hand tools, in portable electric or air motors; and in drill presses, lathes, and other spindle-type machines. Holes require no after-filing, grinding, or reaming and are clean and free from burrs. For complete specifications and prices, write the Robert H. Clark Co., 9330 Santa Monica Blvd., Beverly Hills, Calif., *or check number 38 below.*

Adjustable Table with Interchangeable Tops

Voss Machinery Company of Pittsburgh announces a new Rightop Work Table and rack which allows as many as 12 jobs to be kept "on the board" at the same time. The removable tops simply lift off and slide into the rack until needed. The table height may be adjusted by turning the crank and the top may be tipped to any angle suitable to the individual operator. The table provides an ideal way of expanding facilities in a small shop so as to

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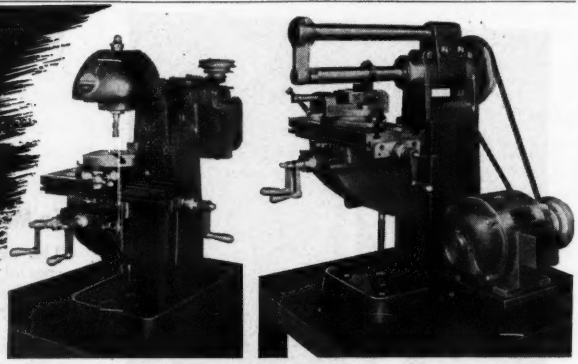

Vertical Mill — Horizontal Mill with Overarm

EVERY WOOD, PLASTICS, OR METALWORKING SHOP NEEDS ONE OF THESE VERSATILE, LOW-PRICED BENCH MILLING MACHINES

Here's a vertical miller that is easily and quickly converted to a conventional horizontal machine with overarm and arbor simply by interchanging spindle attachments.

Developed for intricate toolroom work, it does "everything"!... precision die making, die sinking, slotting, facing, side milling, key seating, jig boring, angle slotting, etc. . . . all in small space at a price that helps cut your budget needs.

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benchmaster's sturdy inclinable 4-ton bench punch press... 6" rotary table . . precision collets . . . swivel vise, etc. are in use in hundreds of machine shops in over 50 industries. Proven ease of operation, maximum safety and negligible maintenance costs make them ideal for school shop installations—mail the coupon at once for engineering specifications.

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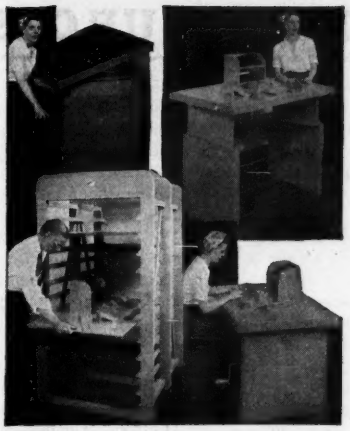
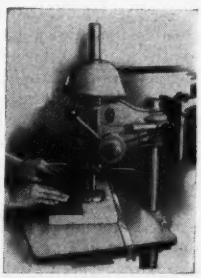


accommodate more students throughout the day with a minimum of time and effort lost in putting away unfinished work only to get it out again and set it up the next day. Write the Voss Machinery Co., 2876C West Liberty Ave., Pittsburgh 16, Pa., *or check number 39 below.*

Drill Press Work Table



This Barron all-metal aluminum alloy auxiliary drill press work table, designed to fit any type of drill press, enables the owner to utilize his drill press for all types of work pieces in such operations as shaping, planing, drum sanding, routing, drilling, surface grinding, tapping, etc. Equipped with anchor bolts for fastening to the standard drill press work table, it has threaded holes to take many types of shaper fences and is equipped with an irregular shaping pin. A cadmium-plated pivoting steel fence equipped with a high-speed hand clamp makes positioning of work easy and is extremely useful for a number of operations with the Barron Rotary Wood Planer. For full specifications, write the Barron Tool Co., 415 Brainard, Detroit, Mich., *or check number 40 below.*

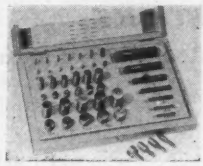
Keystone Overhead Projector

This new Keystone projector enables the instructor to face his class at all times—a pencil used to point out a certain part of the slide will be projected as a clear shadow on the screen, making it unnecessary for the instructor to approach the screen or even to turn toward it. Transparencies of any size from 3" x 4" to 2" x 2" or strip film may be projected with equal ease and clarity; the short-focus lenses produce a 4' x 4' projection at 7 feet.

Unique feature of the projector is the special etched glass upon which pencil drawings and tracings can be made quickly and accurately. Transparent colored crayons and colored inks, as well as a special device for the projection of typewritten material, are also supplied. Shadow projection of small machine parts is quite practical with the projector.

For further information write to Keystone View Co., Meadville, Pa., *or check number 41 below.*

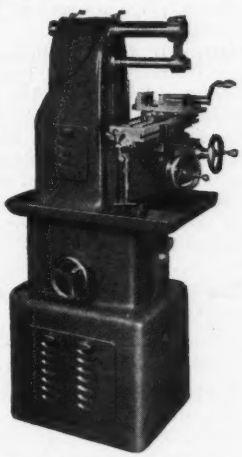
Plug Gage Blanks



A set of 36 cylindrical plug gage blanks in steps of 1/16" with handles is now available at a reasonable cost from the George Scherr Company in New York. The set makes it possible to make any size plug gage from .029" to 1.000" with a few minutes' work on a cylindrical grinding machine, by grinding when a commercial finish is desired or by lapping for gages of higher standards. The blanks are oil hardened throughout, shank finish ground, and centers on both ends are lapped. The plug gage blanks may also be bought singly or in any quantity in any size shown in the set. For full details write the George Scherr Co., 200 Lafayette St., New York 12, N. Y., *or check number 42 below.*

Sheldon Acquires Vernon Line

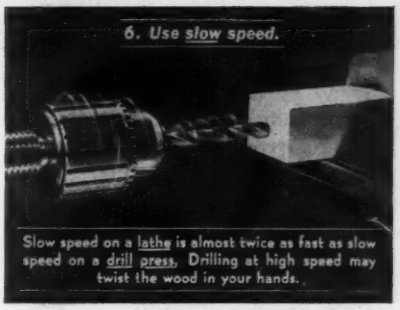
Sheldon Machine Company, Inc., of Chicago, builders of Sheldon precision lathes and arbor presses, announce the acquisition of the Vernon line of machine tools. Vernon horizontal and vertical milling machines and jig borers, 12" back geared shapers and universal tool and cutter grinders built and sold by the Machinery Mfg. Co. of Los Angeles, Calif., will in the future be manufactured at the Sheldon plant in Chicago where production will be planned to permit deliveries shortly after the first of the year.



For complete information write the Sheldon Machine Company, Inc., 4240 N. Knox Ave., Chicago 41, Ill., *or check number 43 below.*

Safe Practices in Woodworking

Designed to aid the shop teacher in instruction, review, and testing on basic shop safety and safe practices with specific machine tools, this series of 22 discussional type slidefilms is now available from the Jam Handy Organization of Detroit, Mich. Special photographs, drawings, and charts total more than 1100 individual teaching pictures. Each of the 22 lessons concludes with a set of pointed review and test questions, based on the teaching material shown and discussed previously on that subject. Planned and produced to meet the shop teacher's needs, the series includes films on hand tools, the tool grinder, drill press, lathe, planer, sander, jig and band saws, circular saw, etc., as well as such general subjects as safety inspection, training for emergencies,


6. Use slow speed.
Slow speed on a lathe is almost twice as fast as slow speed on a drill press. Drilling at high speed may twist the wood in your hands.

Copyright by the Jam Handy Organization

aid for injuries, eye protection, power supply, etc. For full information write the Jam Handy Organization, 2900 East Grand Blvd., Detroit 16, Michigan, *or check number 44 below.*

New Literature . . .

Picturol Catalog lists single and double frame 35mm non-inflammable films on vocational training and guidance available from the Society for Visual Education, Inc., 100 East Ohio St., Chicago 11, Ill., *or by checking number 45 below.*

Electro-magnetic chuck and "Selectron." DoAll announces a new chuck and current-rectifying, demagnetizing, and power-varying unit. The Selectron, furnishing D.C. power, gives the operator control over the magnetic pull from the chuck and also demagnetizes the chuck. This variable magnetic pull makes possible the grinding of difficult jobs such as flat warped pieces. For bulletin, write Continental Machines, Inc., 1301 Washington Ave. South, Minneapolis 4, Minn., *or check number 46 below.*

Practical Design for Arc Welding, Vol. I, by Robert E. Kinkead is the first volume of a set of three published by Hobart Brothers Company at popular request following the original publication and distribution of a number of the design plates in loose leaf form. For full details write the Hobart Brothers Co., Hobart Square, Troy, Ohio, *or check number 47 below.*

Hardsteel, a new operator's manual published by Black Drill Co., contains much information on the "hardsteel" technic of drilling steels hardened by any method and the machining of tough abrasive metals. For your copy write the Black Drill Co., 1400 East 222nd St., Cleveland 17, Ohio, *or check number 48 below.*

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Interesting presentation of aviation fundamentals, including: types of airplanes, materials, structural methods, fittings, assembly; controls and stresses; etc.

PRIVATE PILOT'S HANDBOOK

By A. G. Norwood, Educational Specialist, Civil Aeronautics Authority.
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This book fills the need for a single textbook designed to prepare the student pilot for the examination for a private pilot certificate in seven parts.

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Specified NAVY text, also used by ARMY and MARINE mechanics and aviators.

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A practical guide for the model-airplane builder, telling how to design, build and fly championship model airplanes.

THE GIRL MECHANIC'S MANUAL

By Daniel J. Brimm, Jr., formerly instructor in aviation mechanics and author of various books on the subject, now on active duty as Commander in U.S. Naval Reserve; and Ernst Scheifele, Partner, Aero Trades Company.
Cloth 5¼"x8¼" 176 pages illustrated $1.75
A book designed to introduce the new girl mechanic to her work without alarming her by undue emphasis on technicalities.

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INSTRUCTIONAL RESOURCES

Inquiries concerning materials described in these columns may be addressed to SCHOOL SHOP, 330 S. State St., Ann Arbor, Mich.

BOOKS:

Aircraft Sheet Metal Blueprint Reading? Coxen, Jackson, Masters. Chicago: American Technical Society, 1944. Pp. 132. $2.50.

The great need for trained blueprint readers in industry and the lack of time available to train them have raised the question of the practicability of teaching blueprint reading through the mastery of mechanical drawing. The authors of this book have devoted considerable time and thought to the development of a different approach to the teaching of blueprint reading. Numerous requests for the material which the authors organized for teaching inexperienced workers in aircraft sheetmetal work have brought about the publication of it in the form of this workbook. The book opens with a glossary of terms and a list of abbreviations commonly used, reviews arithmetic necessary for blueprint reading, and then discusses drawing as the "language of industry." The fundamental features of a drawing and the various kinds of drawings are treated, and the essential information given on a blueprint is discussed. The remainder of the book is devoted to practical questions based on typical sheetmetal drawings.

Harry H. Coxen is Industrial Coordinator and Teacher Trainer in Trade and Industrial Education, Kansas City, Mo., and former Educational Director of the U. S. Navy Teacher Training Center, Chicago, Ill. Gerald E. Jackson is Supervisor, Engineering Clarification and Change Control, and Gilbert D. Masters is Assistant Superintendent in Production, both for North American Aviation of Kansas at Kansas City, Kansas.

The Radio Amateur's Handbook. West Hartford, Conn.: American Radio Relay League, 1944 (revised). Pp. 480 + 174. $1.00.

This standard manual of amateur radio communication contains four sections, plus a catalog division of 174 pages and an index. The introduction is followed by an explanation of principles and design, including electrical and radio fundamentals, vacuum tubes, radio-frequency power generation, power supplies, wave propagation, etc. The third section, *Construction and Data,* contains much information on receiver and transmitter construction, modulation equipment V.H.F. receivers, transmitters, and transceivers, antenna construction, measurements and measuring equipment, workshop practice, etc. Operating and traffic handling are discussed in the last chapter. Almost 2,000 figures and line drawings are included in the book and many useful tables are also given.

Form and Standards for Thesis Writing. Newsom, Walk. Scranton, Pa.: International Textbook Co., 1944. Pp. vi + 103. $1.25.

This manual, developed primarily for those who are preparing or planning to prepare theses, contains much information of help to individuals preparing manuscripts for publication, since the rules and form for both are similar, and the exceptions are noted. The materials of the manual are the result of years of experience in supervising the preparation of graduate theses. Subjects covered include institutional policy; content and its organization; format of the thesis; language practices; instructions for typing the manuscript; tables, graphs, and figures; citations and footnote references, and the bibliography. Appendix, index, and bibliography are included.

N. William Newsom is Director of Instruction and Professor of Education at Western State College of Colorado, and George E. Walk is Dean of Teachers College, Temple University.

Essentials of Precision Inspection. Mollard. New York: McGraw-Hill Book Co., 1944. Pp. xi + 207. $2.40.

A tool-inspection study manual, this book holds that the true function of inspection is to increase quality, reduce costs, and make possible the fabrication of mating parts anywhere in the world without fitting. Detailed instruction in the use of the various measuring instruments; technical and related information on threads, gears, key slots, etc.; and the procedures to be followed in checking a piece of work to specifications are given. Related information and work problems are arranged in sequence from elementary to advanced problems. As the problems become more advanced the student begins to repeat, using tools that have already been used since the development of skill requires repetition as well as many hours of continuous work to develop and improve one's feel or touch.

Wesley Mollard is a journeyman toolmaker and an instructor in machine shop at the George Junior Trade School in Detroit, Mich.

Direct-Current Circuits. Morecock. New York: Harper & Brothers, 1944. Pp. xviii + 387. $3.25.

A text for DC courses in technical institutes, junior colleges, industrial schools, and especially for ESMWT and other war-training courses, this book and its companion volume, *Alternating-Current Circuits,* provide the basis for a complete introductory course in electricity. Both books may be adapted for self-study.

The material is presented in units, each illustrated with carefully worked out problems and followed by a group to be solved. Additional review problems are found at the end of each chapter, and answers for the some 300 problems are included in the text. Laboratory experiments, with apparatus and procedure clearly indicated, and relating closely to the subject matter of the text, are given for all but one of the chapters. A list of review questions is found at the end of each chapter. The ten chapters center around elementary electric circuits; magnetism and electromagnetism; instruments and methods for measuring voltage, current, and resistance; power and energy; conductors and insulation; batteries; other electric circuits; the magnetic circuit; electromagnetic induction; and capacitance-electrostatics. Appendixes include laboratory

report writing, instructions for plotting graphs, relations of units, electrical systems, wire tables for copper conductors, resistivity and temperature coefficients of metals and alloys, etc.

Earle M. Morecock is Supervisor of the Electrical Department, Rochester Athenaeum and Mechanics Institute, Rochester, New York.

PAMPHLETS:

Refrigeration Course Outline, designed and prepared to assist local directors of vocational education and instructors in planning and conducting courses for persons engaged in the refrigeration maintenance and repair service, will also serve as a guide for instructors of courses in related and technical subjects pertinent to refrigeration service. The outline is designed specifically to apply to short and intensive courses for workers already engaged in refrigeration service and for learners. For each unit of instruction a general subject is indicated and suggestions to instructors are given, including references to the basic text, *Modern Electric and Gas Refrigeration,* published by the Goodheart-Willcox Company, Inc. The course is planned for 200 clock hours. The outline is available from the U.S. Office of Education, Vocational Training for War Production Workers, Washington 25, D. C.

Safety for Workers in Machine Shops, a 68-page booklet issued by the Vocational Training for War Production Workers Program, Board of Education, Rochester, N. Y., contains much valuable and well-organized information on safety and how to obtain it. Discussions of safe clothing, safe lifting, ladders, falls and falling objects, hand tools, machine tools, fire, and first aid are included. Cartoons and line drawings make the booklet even more interesting and informative. Indexed.

Evaluating Apprentices is a 20-page booklet designed to meet the long-felt need for technical advice on how to determine the cost of training apprentices, as compared with the value of their production while in training, as well as how to record the skills apprentices acquire as they advance from one step of their training to the next. The booklet was prepared especially for training directors and others responsible for apprentice training. Two articles relating to record keeping in apprentice training—one as applied to training costs, and the other as applied to skills acquired during each step of the training—are included. Graphs, charts, and sample record sheets are included. For your free copy write to Apprentice-Training Service, Bureau of Training, War Manpower Commission, Washington, D. C.

VISUAL AIDS:

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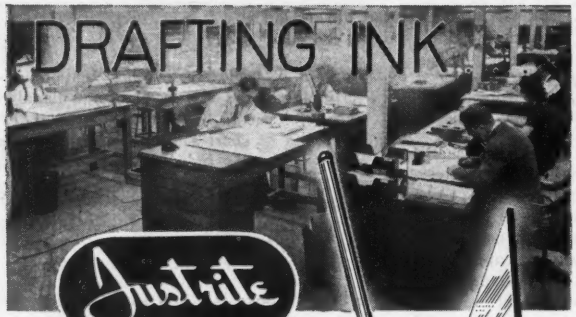

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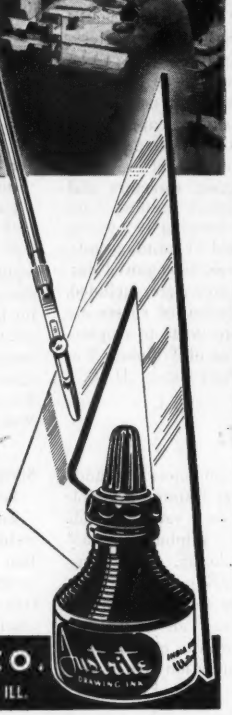

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fromWashington... *from page 32*

periodical will try to keep association members "on their toes" for the postwar tasks facing them.

To strengthen the AVA periodical, publishing services (art work, photographs, advertising, distribution) will be provided by the Scholastic Corporation of New York City. Control of editorial content and advertising remain with the AVA in Washington.

● And now it's time to pack and go to Philadelphia for the AVA's Reconversion Vocational Training Conference which opens December 6.

Under close scrutiny at this Conference will come the problems of three types of individuals — the discharged veteran, the displaced war worker, and the youth entering employment in the postwar years ahead. Army officials and representatives of management, labor, and education will sit down at one of the sessions to consider how the school shop can help these three groups of people become productive citizens after the war. What is discussed and explored at Philadelphia in December will undoubtedly be carried over to many a conference table of businessmen, labor leaders, and government officials for follow-up action in the months to come.

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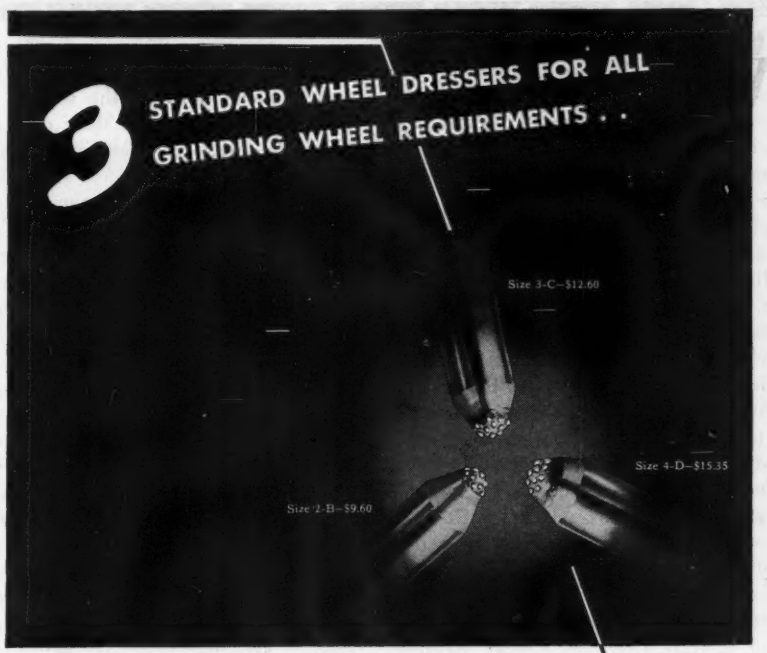

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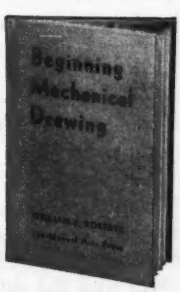

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from WASHINGTON by MICHAEL PACA

WHEN the new Congress assembles on Capitol Hill within a few short weeks, its meeting will set off a burst of activity on the part of educators. They will press for action on those vital educational bills which have been laid aside during the campaign months of 1944. Most immediately, they will seek consideration for S. 1946, the George-Dondero bill with its provisions for area vocational schools. Encouraged by President Roosevelt's statement that "the federal government should render financial aid (to general education) where it is needed . . . ," schoolmen will again push for action on the Federal Aid to Education Bill (S. 637). They will fight for the approval of the adult education program written into the University Extension Bill (S. 1670); for increased federal support for 4-H work as provided for in H. R. 4907; for a truly adequate school lunch program; and, finally, for the reorganization and strengthening of the U. S. Office of Education.

● While awaiting the arrival of the legislators in Washington, educational leaders are quietly building the groundwork for these and many other actions to come. A committee headed by Henry F. Alves of the U. S. Office of Education, for example, is working on ways and means to assure schools an equitable portion of surplus war property under the Surplus Property Disposal Act. This law accords schools what is in effect only a Number 2 priority for purchasing surplus equipment—first priority having gone to federal agencies. Furthermore, as President Roosevelt said in signing the bill, "There is danger that the confused methods of disposition and the elaborate restrictions imposed by the Bill will in many instances delay rather than expedite reconversion. . . ." The President signed the bill with the hope that it will soon be amended to liberalize its provisions. It is such needed changes affecting schools which the Alves Committee is now outlining for recommendation to the Surplus Property Board.

● Together with other spokesmen for schools and colleges, vocational educators appeared this month before the Federal Communications Commission to ask for more FM radio channels for school broadcasting. FM means frequency modulation; to the schools it could mean a "home of their own on the air." Additional FM channels for education could give schools state-wide radio networks; direct communications with all the children and adults of all communities, no matter how far from urban centers; and school broadcasts free from static—but more important, free from dependence on commercial stations.

That vocational education is more than passively interested in FM was made clear by William Dow Boutwell of the American Vocational Association. He was sent to the FCC hearings by AVA Secretary L. H. Dennis with a carefully prepared statement on how all branches of vocational education can benefit by use of FM. Boutwell himself is no tyro in the field of school broadcasting. For more than a decade he has pioneered in school radio, only to come to the conclusion that education must have its own radio channels if it is to reap full advantage from use of that modern public domain—the radio spectrum.

Spokesman for vocational educators, Boutwell cited these words of Howard A. Campion, president of the National Council of Local Administrators of Vocational Education and Practical Arts: "The administrators of vocational education and practical arts in the cities of the United States believe that radio will be one of the most important of their teaching devices in the years immediately ahead."

Boutwell went on to tell the Commissioners that trade and industrial teachers have a live interest in securing adequate FM facilities—as witness the fact that New York City and San Francisco FM stations are located in the trade schools of these two cities. These radio stations not only broadcast a wide variety of general courses, but also serve as laboratories for students preparing themselves for technical radio jobs.

Vocational agriculture, too, will be vastly aided by FM, Boutwell continued in his plea before the FCC officials, citing the fact that the "ag" teacher must be in continuous touch with the entire community he serves. The home economics teachers could save untold hours now spent in travelling, if they had FM radio; business and commercial teachers could enrich their instruction; while for vocational guidance, educational radio is a "natural," Boutwell said.

He capped his testimony by placing into the record appeals for more FM channels from Michigan's George H. Fern, of the State Board of Control for Vocational Education; Georgia's M. D. Mobley, State Director of Vocational Education; and from L. H. Dennis, who said: "We are certain that teachers and administrators of all phases of vocational education will find ways and means to use expanded radio facilities. They will use them to improve education and to improve standards of living throughout the nation."

● From the AVA offices will come next month an expanded magazine, the *American Vocational Journal.* The AVA promises that it will be bigger and more comprehensive than its present *AVA Journal and News Bulletin.* No competitor to SCHOOL SHOP, the new

(Continued on page 31)

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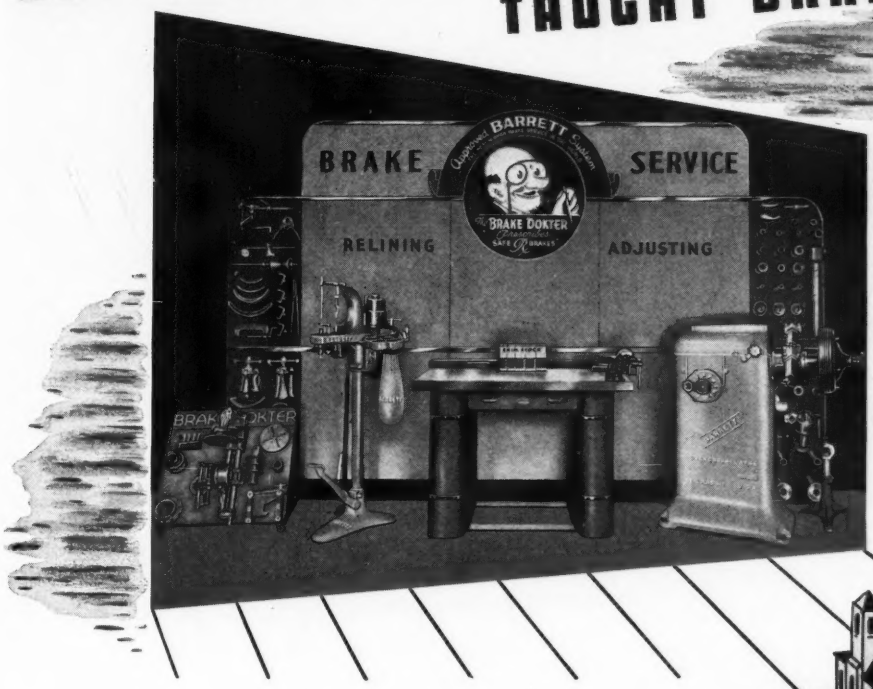

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